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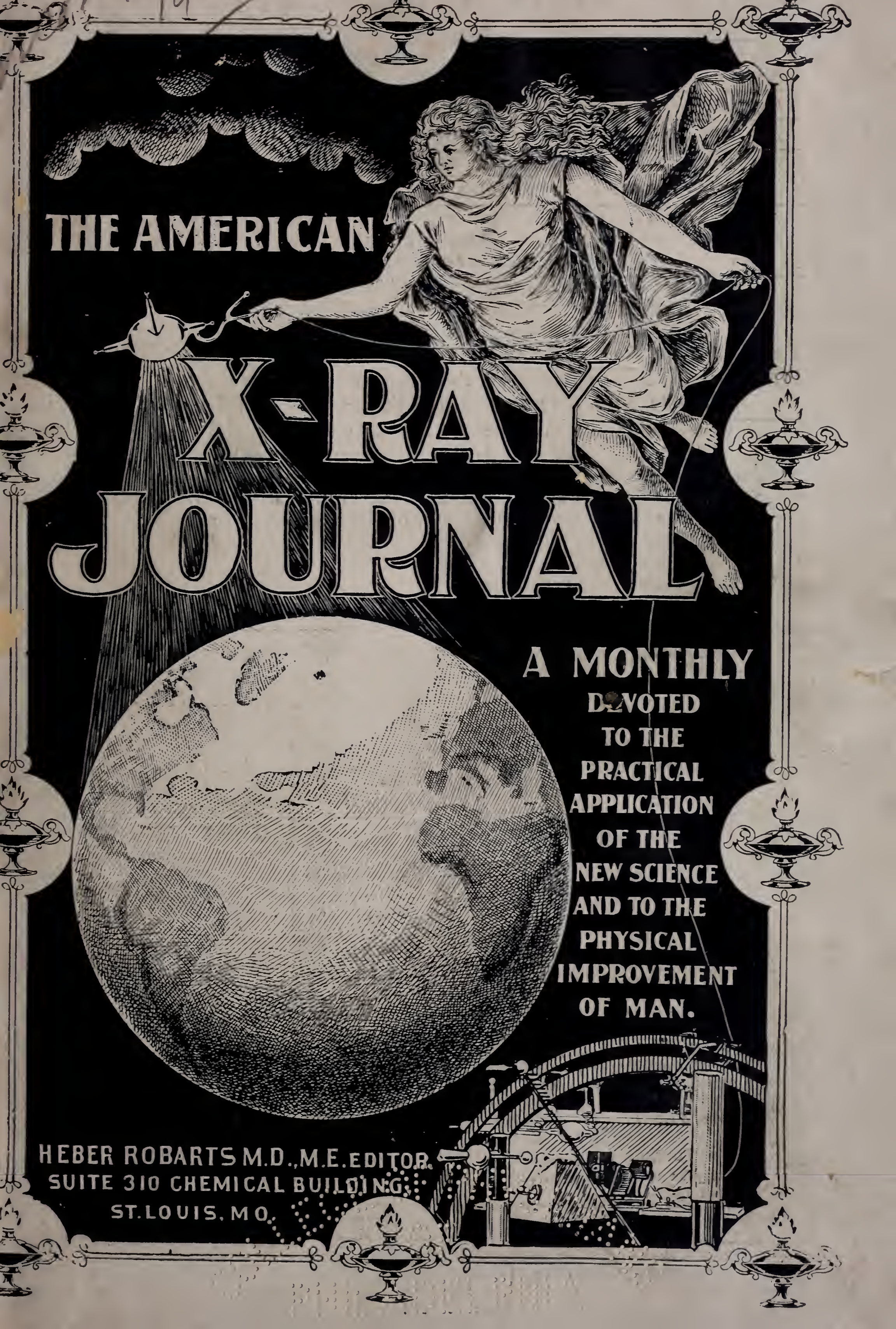

THE AMERICAN X-RAY JOURNAL

A MONTHLY
DEVOTED
TO THE
PRACTICAL
APPLICATION
OF THE
NEW SCIENCE
AND TO THE
PHYSICAL
IMPROVEMENT
OF MAN.

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DR. GEORGES APOSTOLI.

Paris, France.

The American X-Ray Journal.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

VOL. 5. *ST. LOUIS. JULY. 1899.* *NO. 1.*

ROENTGEN LIGHT NOTES.

BY WILLIAM ROLLINS.

NOTE XLV—SUPPLEMENT TO NOTE XLI.

In the accompanying Fig. 42 is shown a form of internal diaphragm tube mentioned in Note xli. For most medical work the best definition is of less importance than the amount of light, but there are structures like the teeth and bones where it is valuable. By combining the internal diaphragm with the thick glass diaphragm, shown in Fig. 34 and in section in Fig. 42, we much improve the definition, and if, in addition, we cover the part to be photographed by a perforated screen of non-radiable material to prevent diffused light and reflections from reaching it, we make a step toward better results. The appearance of the tube when excited is shown in Fig. 43. The second light ring is produced by the forces which come through the opening in the diaphragm. The wide dark ring is the shadow of the diaphragm, as everything beyond this central light circle is cut off by the external diaphragm; practically all the waves which are used come through the central opening in the internal diaphragm, so that the utilized radiant area is always small.

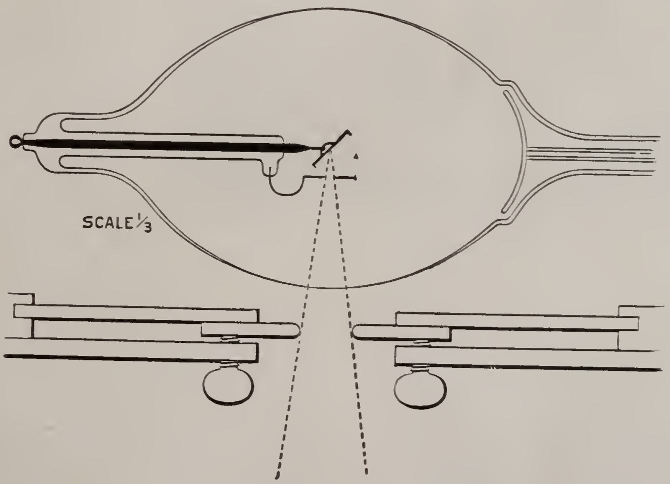

FIG. 42.—"ROENTGEN LIGHT NOTES."—INTERNAL DIAPHRAGM TUBE.

NOTE XLVI—THE ANODE RUSH.

In Note xx the anode rush was mentioned and its effects on the target figured in Note xxi. Here is a figure of the deposit it produces on the glass wall of the tube. Fig. 44 is a half-tone from a photograph of a hollow target intermolecular regenerative tube which has been excited 600 hours without repumping. Notice the central dark figure from the vicinity of which branched sprays like lightning discharges are given off. They are light on a dark ground, In addition to this central figure observe others, one on each side, also with branching figures. If the tube could be turned one-fourth on its long axis the dark central deposit would be found at about the place where the anode rush would strike the glass if it was given off perpendicularly to the surface of the target. This tube having been run for investigation has been purposely kept in harmony with the generator. In Fig. 45 is shown a tube, which has been purposely run out of harmony to show discord as a visible metallic deposit on the glass, to illustrate the importance of having things in tune if we wish to economize power. Here the Crookes stream was kept flashing and spattering. By using a powerful generator, carefully focusing the Crookes stream on the target and using a very light gas for the vacuum, I have seen one form of the anode rush. The platinum target must be very thick or it will be perforated in a moment, because the sudden stopping of the Crookes stream at the impact area of the target raises the platinum to vivid incandescence, small pieces of the melted metal, being thrown off, remaining visible as minute stars even at a distance of half an inch in front of the target. These stars do not come off exactly perpendicularly to the surface, but spread, and if I did not have other abundant proof of the existence of radiant matter, my credulous and unscientific mind would be unable to resist visualizing such a cathode stream as described by Crookes, striking the target and causing the starlike particles of incandescent metal to spread as they left the surface.

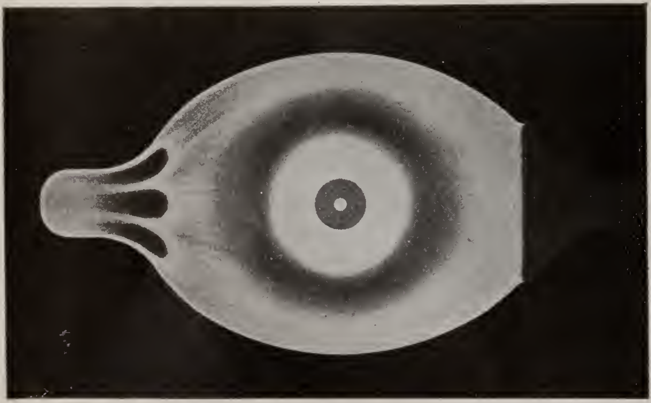

FIG. 43.—INTERNAL DIAPHRAGM TUBE EXCITED.

NOTE XLVII—THE SEEHEAR.

When we look at the heart or lungs it is a comfort to hear what they are saying to us and to be able to draw what is shown on the screen. The instrument here figured enables this to be done. As shown in Fig. 46, this consists of a frame to which one or more flexible tubes are attached, terminating in the ear pieces of a stethoscope. The frame makes the rim of the sound chamber, the bottom of which is a sheet of some transradiable material, with a hole in it, through which comes the sound. This sheet can be quickly changed for another, with a hole in a different place. As here shown it is approximately right for some heart sounds, when this organ is clearly outlined on the luminescent screen together with the diaphragm. The other side of the sound chamber is formed by the luminescent screen. In front of this is a sheet of celluloid or glass to protect the screen and over it a sheet of tracing cloth. This is the arrangement developed by Dr. F. H. Williams for making permanent records of his chest cases, by marking two fixed points on the tracing cloth and then sketching in outlines of dull or light areas. All parts of the apparatus are held together by the clamps. To show the position of the hole in the back of the sound chamber, a curved piece of non-radiable material is held by a spring clamp to the edge. This also serves as a reflector for sound waves. Fig. 47 shows the arrangement in use. As the room must be dark the photogtaph was made by flash-light. The same plan can be applied to a cryptoscope when we do not wish to make graphic records, in which case the examinations are made in a light room. The size of the screen here figured is 12 by 14 inches. It is of the Kinraide non-phosphorescent type in order to get clear outlines of the beating heart. For women a smaller instrument can be used with advantage on account of the bust development, it being important to get the screen as near the heart as possible so that its shadow may not be too large.

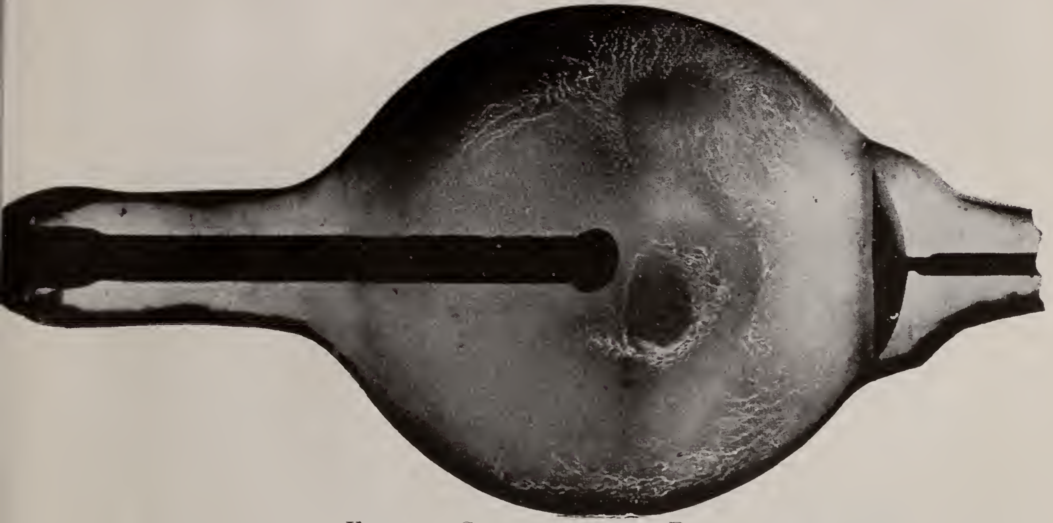

FIG. 44—SHOWING ANODE RUSH.

NOTE XLVIII—ON SEEING AND HEARING YOUR HEART BEAT.

By placing a mirror in proper relation to a luminescent screen, as shown in Fig. 48, a man can see his own heart beat, and by combining the mirror with the instrument, shown in Fig. 46, he can both see and hear it.

A nervous patient, whose organs were sound, would sometimes be much comforted by being shown through his own eyes that all was well. In using this in-

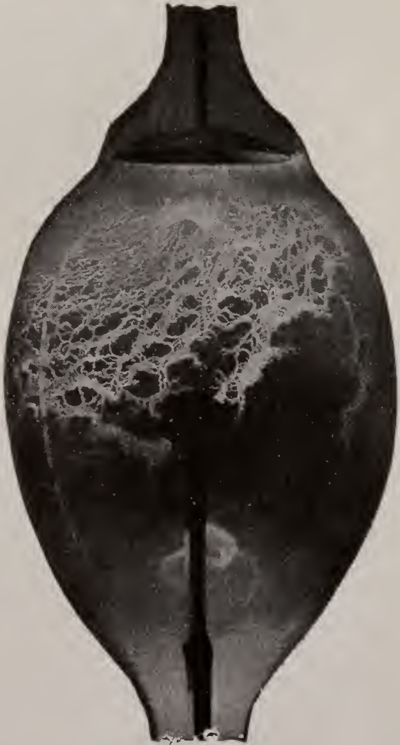

FIG. 45.—ROENTGEN TUBE RUN OUT OF HARMONY TO SHOW DISCORD.

strument the room should be made dark. I have in use another instrument in which both screen and mirror are enclosed in a case through which is a small opening for the patient's eyes. With this the examination can be made in a room with a light. It is, however, somewhat more clumsy than the one selected for illustration.

NOTE XLIX—THE GIRDLE.

In Thompson's interesting book, "Light, Visible and Invisible," on page 265, he shows a figure of a Roentgen light tube which I here reproduce. He says, "as shown in Fig. 142 the rays are emitted copiously right up to the edge of the plane of the anticathode." I do not criticise this statement, but illustrate some phenomena for the consideration of those who accept it. In Fig. 49 a tube is shown in an excited state, which was figured and described in Note xvi. Notice that what is usually called "the line of demarkation" is not a line between light and dark, but is a dark girdle about one-fourth of an inch wide, separating a brightly illuminated from a less illuminated area. Notice also that the illuminated front area is not right up to the plane of the anticathode but in front of it. Moreover, if we make the target cup-shaped with its concavity toward the cathode the dark girdle will extend forward, being wider. This appearance is well shown in Fig. 50. As we increase the depth of the concavity in the target the front illuminated area is pushed more forward. Under some conditions we can, on the contrary, make this girdle very narrow by using a flat target, a high vacuum and electro-motive force.

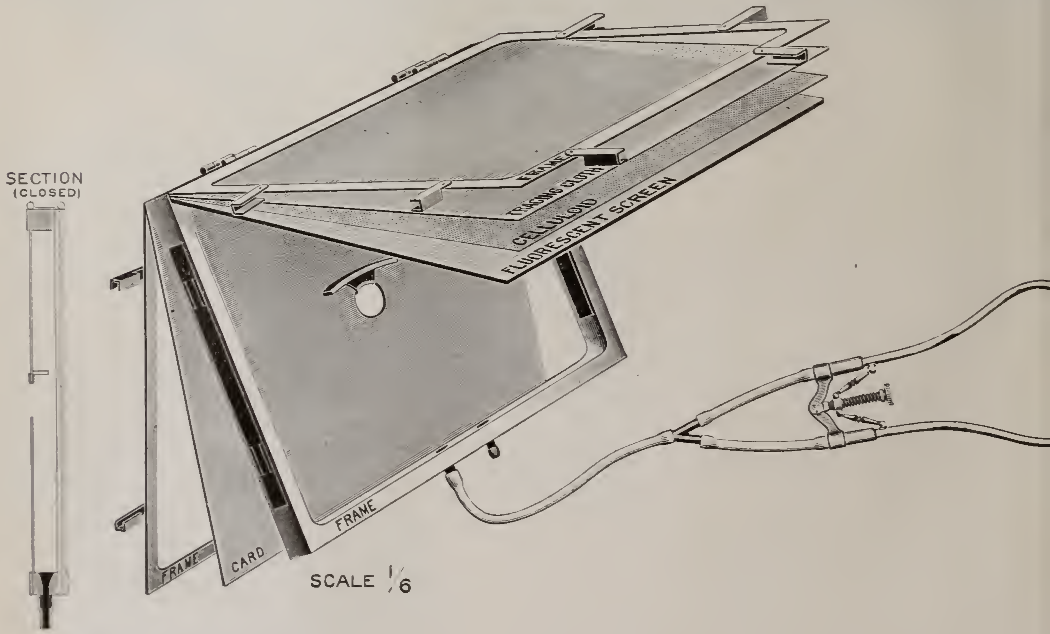

FIG. 46.—THE SEEHEAR.

As the illustrations to these last few notes are not all from photographs, allowance should be made for the personal element, though the artist tried to draw what he saw. In Fig. 44, which is a photograph obtained after many struggles, the light branching lines did not show well on the half-tones made. They were, therefore, retouched under a microscope in order to make them look as in nature. They are now a little too pronounced, though substantially correct. There are many appearances in vacuum tubes which I should be glad to describe if it were not practically impossible to photograph them. Perhaps, after more trials, a way may be found. For example, many attempts have been made to photograph what I call the corona of the tube, an appearance shown in the half-tone No. 51. But the appearances change so rapidly that the short exposure required does not give light enough to impress the plate. As it may be a long time before a photograph can be made of this. I publish the cut from the wash drawing to call the attention of others to the matter, which is of considerable interest from a theoretical point of view. This is also true of the appearance I call the girdle, which will be discussed more fully when I can get good photographs of it, so that the foundations of my theories can not be disputed, or be said to depend upon imaginary appearances.—*Electrical Review*, Feb. 8, '99.

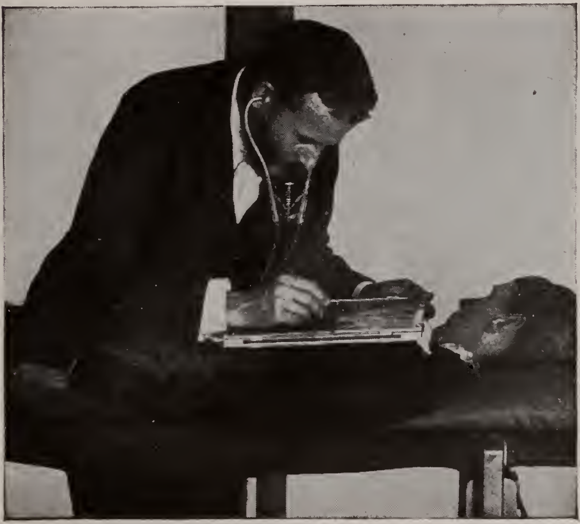

Fig. 47.—Showing Seehear in Use by Physician.

NOTE L—ROTARY TARGETS.

In Note xi; January 5, 1898, I described a revolving target tube for experimental work. As I am not aware that such a thing is being commercially produced, I consider it desirable to illustrate it in practical form, for if one does not care to use the cooled target tube shown in Note i, December 1, 1897, he will constantly be embarrassed by having his tube ruined by perforation of the target soon after it gets in primec ondition. There is such a terrible heat from the impact of the stream of Crookes radiant matter that no known substance can endure unless it is cooled. Platinum melts like ice in the sun when any considerable amperage is used. Increasing the thickness of the metal retards the inevitable, but a simpler way is to make the target revolve, thus bringing fresh surfaces to receive the cathode stream. In Fig. 52 I show such a tube in its simplest form, though here the revolving is not automatic. Fig. 53 gives the target full size. Fig. 142 should have been published with Note xlix, but owing to carelessness in forwarding, it was received too late; I therefore write this note sooner than was intended to give it place.

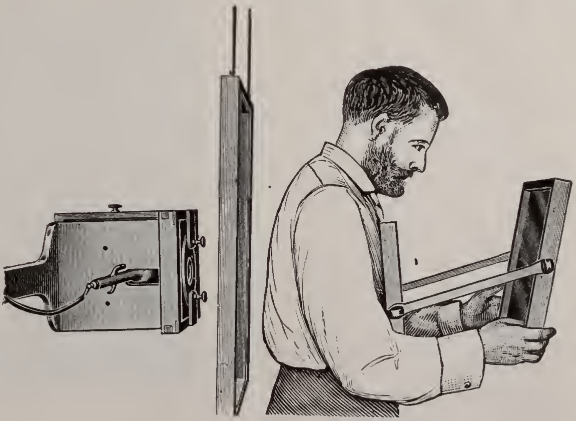

Fig. 48.—Showing Seehear in Use.

NOTE LII—LIGHT GASES.

There are present in the air gases in comparison with which hydrogen is heavy. A scientific man would not make this statement on the evidence I possess, but as such things are with me only what a poet has called "considerations by the way," I do not hesitate.

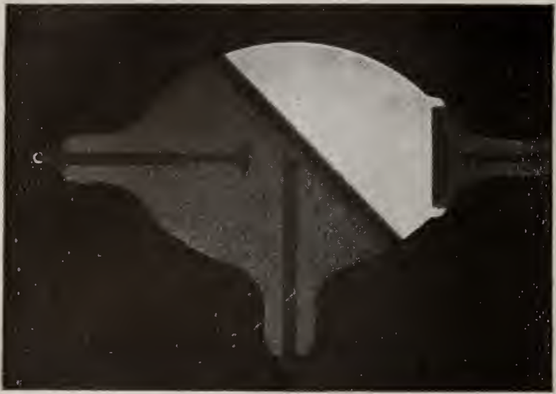

FIG. 49.—SHOWING "GIRDLE."

Since Roentgen's discovery was announced I have had tubes under observation for a great number of hours, because having constructed an apparatus which runs continuously without either noise or attention for any length of time, I have usually had a tube excited all day for many days in succession, in order that I might, during the intervals of work, glance at it to see if there was anything new to think about. As a result I imagine there is a period of maximum efficiency to which an ordinary tube never after attains until it is again opened to the air and repumped. When the vacuum gets too high it is a simple matter to lower it with either my oxygen or hydrogen regenerators so that the tube may be run indefinitely without repumping, but we do not restore the pristine brilliancy which has gone, as Omar would say—"with the rose of yesterday." I explain this perhaps vain imagining by saying there are unknown gases of extreme lightness. I am aware that Crookes considers Brush's etherion to be only water vapor, but perhaps this may only show either "what need there is to be reserved in speech," or how desirable it is to study water vapor. I believe that some metals—aluminum, for example—contain these new gases, and that the initial maximum radiance is due to them. Such light gases would be projected in the Crookes stream with enormous velocity against the target and raised to a high temperature by the shock, generating waves of short length. Having this in mind, I constructed a tube on the principle of my intermolecular hydrogen regulator, the regenerator being of aluminum. I also made a tube with a hollow aluminum cathode, as mentioned in Note vi, December, 1897, the theory being that, as the aluminum was in contact with the air on one side, the gases might be caused to pass through to supply the loss. I shall some time have more to say about this. In the meantime, some one with abundant time may possibly be interested to work on it. Some statements in this note may appear inconsistent with what was said in Note xxvi, but they are not so much so as they seem, and if they were, what

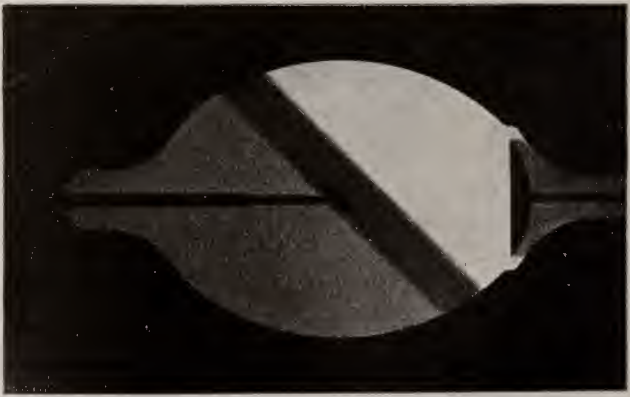

FIG. 50.—SHOWING "GIRDLE."

matter? Has not Emerson said, "Consistency is a vice of small minds?"

NOTE LIII.

ON THE EQUIVALENT AIR GAP.

In Note xxxv it was said that it was unsafe to record the length of the equivalent air spark as a measure of the degree of the vacuum in a tube, that other data should be given. Recently in attempting to make a generalization from my experience with vacuums I found my early observations useless, because I had relied on this ancient and comparatively useless measure. I therefore point out some things which should be considered with it to make the records of value: The distance between the terminals; the form, area, nature and temperature of the terminals; the shape of the tube; the kind of gas; the length of time the tube has been used; the voltage and amperage of the current; the kind of generator, including the form, size and rapidity of the surges.

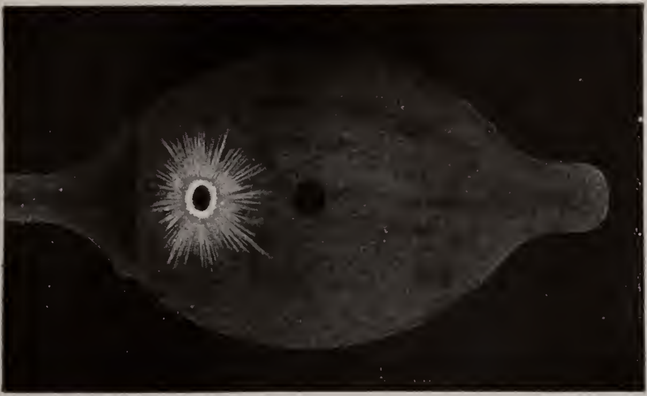

FIG. 51.—SHOWING THE "CORONA."

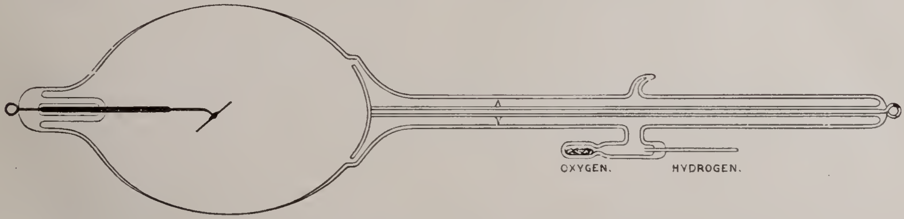

FIG. 52.—SIMPLE FORM OF REVOLVING TARGET TUBE.

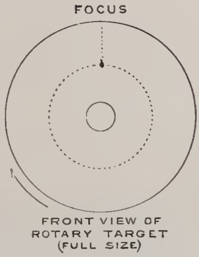

FIG. 53.—FULL SIZE VIEW OF REVOLVING TARGET.

NOTE LIV—MULTIPLE PHOTOGRAPHY.

In this journal for July 1, 1896, I described what I thought was a new principle in radiography, consisting in taking several photographs at one exposure. I have since learned that Prof. E. Thomson was the discoverer of this plan. However, as I do not see his method in use, I venture to call renewed attention to it, for Professor Thomson is so occupied with other things that he probably would never take the time to mention it again. What a surgeon wants, when he sends a patient to the Roentgen laboratory of his hospital, is to have a picture of the injury delivered to him in a few minutes, so that he can at once use it in his diagnosis. When he finds he must wait some hours, or a day or two, he instinctively avoids the method, his time being too valuable to lose. Professor Thomson's method enables him to get not one, but a number of positives in a few minutes, one of which will almost surely be better than would be the single plate taken in the usual way. The method consists in placing half a dozen sheets of bromide paper in a pile, and on top the part to be photographed. On developing all the prints together in one dish at the same time, six positives are obtained instead of one negative, and, by flooding these with alcohol, they can be dried at once.

NOTE LV—CONCAVE ANODES.

There is nothing new in the idea of concave anodes, several experimenters having used them, notably Dr. Girdwood, of Montreal, but I have never seen any statements of the reasons why this form was tried. I mention one or two appearances connected with it which may be of interest. First, as shown in Note xlix, the girdle is broader and further forward than with the flat anode. Second, instead of the corona, as shown in Fig. 51, Note xlix, there is a brilliant sun of smaller size than the anode and situated on the wall of the tube where the particles would strike, if they went off normal, to the surface of the anode. This sun is surrounded by a halo. Third, there is less discharge from the back of the anode. Therefore as the tendency in a vacuum tube is for the particles to collect at the anode end of the tube, giving rise to uneven pressure, this form of anode has the advantage of sending most of the anode rush toward the cathode end, thereby, perhaps, helping to equalize the pressure and being compacted it should interfere somewhat less with the Crookes stream. Being as simple to make a concave anode rotate as though it were flat, it need not burn out any faster.—*Elec. Rev.*

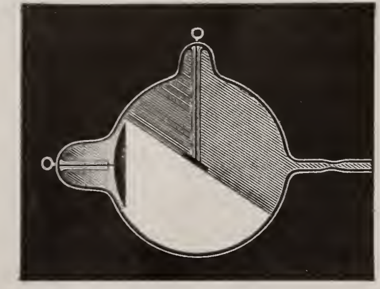

FIG. 142.
From Thomson's "Light, Visible and Invisible."

A STEP IN THE DIRECTION OF SUPERLATIVE RADIANCE.

BY DR. ALEX. L. HODGDON.
Professor of Nervous Diseases and Diseases of the Mind, Maryland Medical College, Neuralogist to The Home for the Aged.

Ever since the intelligence of the most wonderful discovery of the age was flashed across the wires, January 7, 1896, stating that Professor W. Conrad Roentgen of the University of Wurtzburg had caused the forces of nature to give birth to a new form of light, investigators have ever been striving to increase the powers of penetration and brilliancy of this very beautiful type of radiant matter. Now, what are the conditions favoring increased or diminished radiance? We know the higher the vacuum that the electric spark will pass through, the greater the resulting radiance and as a matter of convenience I will speak of low resistance vacuums and high resistance vacuums, when dwelling on this subject, although after the spark has once passed through the vacuums it forms a very interesting subject upon which to reflect as to how exactly what does take place within the x-ray tube.

It seems hard to believe that a purely atmospheric vacuum can be diminished or increased by an electric spark passing through it, from either of two directions. The condition known as a low resistance vacuum is supposed to be benefitted by connecting the reflector end of the tube with the cathodal discharge or doing what is known as running the tube backward. To overcome a very high resistance vacuum (and the higher the resistance vacuum overcome, the more rapid will be the penetration) various methods have been proposed. Monell of Brooklyn transfers the current by making a warm bridge with his hand, others may heat the tube slightly by means of an alcohol lamp, whilst Graves of St. Louis, during experimenting with tubes of such high vacuum that no discharge whatsoever would pass through them, accidentally dropped a piece of tin foil from his hands on the tube and immediately noticed luminosity in the tube which had been brought through use to such a high resistance vacuum that no electrical discharges would pass through it after which he formed bridges out of foil with which to increase radiance. This device had been previously resorted to by several operators, Monell in particular.

In doing my work I prefer to use a static machine as it has an enormous voltage and very little amperage. I believing that the voltage is of great value, and the current of decidedly minor importance ; opinions may differ, however, as to this and there may be many warm advocates of the coil. I use a Toepler machine, and believe it adapted to the work as well as any machine on the market.

The electricity generated by the static machines being of such high voltage that it mounts up into the hundreds of thousands of volts, is of a very diffusible character, its nature being to disseminate itself through various media and would seem to ground itself through these media. I have even received small sparks from the pulley wheel of the machine, and consequently if insulating methods are defective, it would tend to leak off into the atmosphere rather than pass through a Crooks tube, having a very high resistance vacuum. Naturally the greater the voltage passing through a Crooks tube the more readily the high resistance vacuum will be overcome, and the greater will be the radiance. This leakage of electricity into the surrounding atmosphere causes a great diminution of luminosity and penetration. An expedient has been used I believe to remedy this defect by wrapping both terminals to their connecting wire, and including the glass ends of the tubes.

I have been using number 16 rubber insulated wire to conduct my electricity to my tube, but found the tendency to leak was very great, where it joined the tube. A short while ago I had my wires crossed, and quite near to each other while I was in the act of radiographing a femur. My tube was glowing, when suddenly I noticed my electrical discharge break through the insulating and spray in its beautiful purple characteristic manner. This naturally had a tendency to decrease the luminosity of my tube, and in a few moments it sought its opposite potentials, by breaking through the insulating of the other wire in order to meet in mid air. In order to overcome this I considered the propriety of wrapping the punctures in the insulating with electrician's tape, but upon second thought I considered the possibility of its holding a current with such a very high potential as very slight, unless the tape were particularly good. About this time an employee in the electrical store suggested using rubber tubing as insulating, which I did, and found it a great success, but only ran it up to my tube leaving the glass arms uncovered. The idea occurred to me why not insulate the rubber covered wire completely by not only running them through rubber tubing from the prime conductors to the tube but upon reaching the glass arms of the tube, drag the rubber conduits over them, and thus almost, if not quite, hold the heavy voltage which is so important in the generation of the x-rays, and so characteristic of the static machine. Having adjusted my rubber tubes after that fashion I turned on my current and was yielded dazzling radiance.

The plates of my Toepler machine, run by a Holtzler Cabot, ⅛ horse power electric motor, were revolving rapidly and the glow of my tube was one steady, beautiful radiance, which I have noticed every time I have used the rubber tubing since, that there was a complete absence of any escape of potential near the tube, or if any were present I could not discern it. In this way I believe a very large proportion of the voltage generated by the machine, was utilized in the production of radiant matter by making it pass through the tube. Of course this expedient is of use only in tubes having sufficient resistance by means of their vacuum to produce a glow, because in a tube having a very low resistance vacuum nothing short of a return to its makers for re-exhaustion will prove to be of any practical benefit.

High-Frequency Currents in Therapeutics.

Tesla. "*Elec. Eng.*, Nov. 17, "*The Electrical World.*"—A reprint of a paper read before the Amer. Elec. Ther. Assn. in September.—While chiefly of interest, to physicians; it contains some things of general interest, besides good diagrammatic illustrations of the various systems of producing high-frequency currents. One of the remarkable features of such currents is their apparent harmlessness, which makes it possible to pass large amounts of electrical energy through the body without pain or discomfort. The electrical actions may be divided into three classes, the statical or that depending chiefly on the magnitude of the potential; the dynamical, depending chiefly on the quality or quantity of the current, and thirdly, effects of a distinct nature due to electric waves. These three actions are generally co-existent, but one or the other may be made to predominate. Various methods of connecting the circuits are described with the aid of diagrams, and are briefly discussed. When one terminal of a high-frequency series is connected to ground, certain peculiarities will be noticed; it may be of some consequence which terminal is connected to the ground, as in high-frequency discharges the impulses in one direction are generally preponderating. One of the noteworthy features of these currents is the facility which they offer for conveying large amounts of energy to a body entirely insulated in space; currents strong enough to fuse may be passed through a wire entirely insulated at one end; this method affords great possibilities in the hands of the physician, and is discussed at some length; he does not think it impossible to convey to a human body or to give off in space, energy at the rate of several horse-power, while a small part of this amount applied to the human body in other ways could not fail to be injurious. He shows how by varying the period the points of highest potential of the secondary may be shifted along the terminal, and this point may therefore be brought to any part of the body or made to move through it; the body may by this method be subjected to several million volts without injury. With such high electrifications small particles adhering to the surface are torn off violently, and this is the case even with the toughest of the metals; he thinks this can be made use of by the physician as a substitute for a water bath. The inductive action of such high-frequency currents is discussed, both the electrostatic and the electrodynamic, and an illustration is given of an apparatus for producing these effects. He describes some experiments made to produce intense inductive action in a small space, and obtains some surprising results; when the end of a heavy bar of iron was placed within the loop it was raised to a high temperature in a few moments; a sheet of tin was fused instantly, the action being comparable to an explosion; the energy at that point may have been as much as 10 horse-power. He studied the effects of this action on living tissues and found that he could thrust his hand within the same loop and hold it there; he even held his head there, but there is danger in such an experiment; if a conducting path was so formed within the living tissue of the head it would be instantly destroyed, which would be accompanied by death; such a method of killing would be absolutely painless. The only explanation he can offer for the peculiar action is that the tissues are condensers. Pieces of metal embodied in living tissues could thus be heated, affording a possibility of sterilizing wounds or of locating bodies. Most of the results which he obtained are made possibly only by the discharge of a condenser; to give an idea of such an effect he states that a condenser small enough to go into a vest-pocket may create pressures a hundred times greater than those produced by the largest static machine ever constructed; or used in a different way, currents may be obtained far superior to those in the largest welding machines; this is possible because the condenser can discharge in an inconceivably short time. In conclusion he describes a physician's instrument for generating and using such currents.

Difference Between Roentgen and Cathode Rays.---The argument for the essential identity of cathode and Roentgen rays is based upon the fact that there are various kinds of cathode rays, which, as regards deflectibility and penetrating power, may be arranged in a continuous series. In this series the Roentgen rays obtain an extreme place at the end, where the deflectibility is zero and the absorption by solids a minimum. A difficulty occurs at once, through the fact of luminous rays being undeflected and Hertzian waves being unabsorbed under somewhat similar circumstances, which makes the classification of Roentgen rays among cathode rays appear artificial. J. Von Geitler attempts to bring out clearly the essential difference between the two classes of rays by a study of their electrification or ionization properties. He quotes a number of experiments to show that Roentgen rays are absolutely incapable of conveying a charge. They can equalize opposite charges, by rendering the air between them conducting, but they can not, like cathode rays convey an electric charge into the interior of a closed metallic vessel connected to earth or out of such a vessel into the open air. All this speaks in favor of regarding the Roentgen rays as essentially different from cathode rays, and this desideratum is fulfilled by both the new theories of Roentgen rays now before the public, the English wave theory, in which cathode particles when stopped generate single-wave impulses, and the Dutch corpuscular theory which regards Roentgen rays as discharged cathode particles. —Geitler, "*Wied. Ann.*," No. 9, 1898.

The Wehnelt Interrupter.

Concerning the Wehnelt electrolytic interrupter, I herein enclose an extract from Gore's "Art of Electro-Metallurgy" (page 197), which will be interesting to the readers of your journal.

Hoping you will find space to insert it in the columns of your paper.

J. Strachan.

Electrolytic Vibrations and Sounds.—As long ago as 1801, Gerlom observed that mercury exhibited peculiar movements whilst acting as an electrode in electrolysis, and this phenomenon has been since investigated by Sir J. Herschel, Sir H. Davy and others. According to G. Lippman, the contraction of a globule of mercury (whilst acting as a cathode in dilute sulphuric acid), on the passage of the current, is due to a change in the capillary constant. (*Journal of the Chemical Society*, Vol. xi., p. 1,094) It was whilst investigating these peculiar movements and searching for thermic changes in electrolysis, by passing an electric current through a solution of double cyanide of mercury and potassium with mercury electrodes, that I first heard a faint sound, and then observed the surface of the mercury covered with waves; and by further research was led to the discovery of electrolytic sounds; the dancing motion and musical sound being due to the alternate formation and destruction of films upon the mercury by electrolytic action. A paper on the subject in the *Proceedings of the Royal Society*, 1862, contains a full account of the phenomenon, and the influence of various circumstances on it.

The best liquid for producing the sounds consists of 10 grains of cyanide of mercury, and 100 of pure hydrate of potash, dissolved in 2¾ ozs. of aqueous hydrocyanic acid, containing 5 per cent of the anhydrous acid ("Scheele's strength"); the liquid should be filtered. The phenomena usually occur only at the negative electrode, and out of a large number of solutions examined, the only ones in which the phonetic vibrations occurred were those alkaline cyanides containing dissolved mercury. The quicksilver may be contained in two very small watch glasses submerged in the solution, and the current from either two Grove's or five Smee's cells, conveyed to the electrodes by platinum wires, protected, except at the ends, from contact with the liquid by means of tubes of glass or India-rubber. During the occurrence of the sounds the current itself is rendered imperfectly intermittent, and the arrangement may to a certain extent be employed for similar uses to those of a break-hammer.—*Electrical Review, London.*

St. Joseph, Mo., July 3, 1899.

Editor American X-Ray Journal:

Unless attention has already been called to the fact I should like to call your attention and that of your readers to the value of the X-ray from a medico-legal standpoint in determining the relative distance of the individual from the gun throwing the ball in the case of gunshot injury. On two occasions I photographed persons where the weapon was only a few inches from the body when discharged. In the first case I believed that the powder stained point of entrance of the bullet was clearly marked. Fearing, however, that it might only be a coincident flaw in the plate I waited for another case of similar injury. The second case showed even more clearly the exact point of entrance. I then tested with gun powder and found it impervious to the ray. The medico-legal value of this fact will be apparent, while from a surgical standpoint it gives another point from which to measure where great accuracy is required.

Yours very sincerely,

W. J. Bell.

Potential Gradients in Vacuum Tubes.—Wiedemann and Schmidt. "*Wied Ann.*," No. 10; abstracted briefly in Lond. "*Elec.*," Nov. 11, "*The Electrical World.*"—A lengthy investigation of potential gradients as affected by the source of current, by heat, magnetism, light and photo-luminescence of the gas itself. The results were practically the same whether an influence machine or a battery of accumulators was used as the source; the luminous appearances are characteristic of the discharge potential; the heating effects in the glowlight are quite out of proportion to the potential gradient there; in the positive light the whole of the energy given out by the discharge is converted into heat.

Paying Damages for Prolonging Patient's Life.—Here is a very extraordinary case that is causing excitement among physicians and surgeons, not only in England but in all other countries where the medical profession flourishes, as soon as the news reaches them from Dresden. In that capital city of the Saxon Kingdom the Public Prosecutor has announced his intention of instituting criminal proceedings against a practicing physician, under the following circumstances: The doctor received a lady, suffering from some internal complaint, into his private hospital. He found that a small operation was necessary and she consented. When chloroform had been administered, however, it appeared that the mischief was much more serious than the doctor had supposed and that the small operation would not be sufficient. Accordingly he performed another. It proved to be effective; the lady recovered and showed herself deeply grateful —until the little "account" arrived. Then she protested that the greater operation had been unnecessary, and as it was performed without her consent she threatened an action for assault or "bodily injury." Thereupon the doctor sued her for the amount of his bill, $137. The Supreme Provisional Court at Dresden has just delivered judgment. It admits that the operation has lengthened Defendant's life probably, but it was not carried out with her knowledge or approval. It might have been attended with danger. Therefore the Court declared it "an intentional and illegal bodily injury." Forthwith, as has been said, the Public Prosecutor instituted criminal proceedings.—*Chicago Legal Journal.*

The probability is that if x-rays had been employed in making a diagnosis in this case both patient and physician would have had an understanding.—Ed.

Dr. Morris Hale, of Hot Springs, Ark., has added a 4 plate (34 and 36 inch) x-ray apparatus to his office for diagnosis of disease, fractures and for locating objects in the body, and as a germacide, also for electro-therapeutic work in paralysis, and nervous diseases, brain and spinal.

Dr. Charles Sinclaire Elliott, Kansas City, Mo., has recently replaced his 8-plate static, by a 10-plate 30-inch machine for x-ray and electro-therapeutic work.

The American Electro-Therapeutic Association will hold its ninth annual meeting at Washington, D. C., September 19, 20, 21, 1899. The President, Dr. B. F. Bishop, appointed the following Committee of Arrangements:

Drs. D. Percy Hickling, chairman, Jos. Taber Johnson, G. Lloyd Magruder, Z. T. Sowers, Robert Reyburn, G. Betton Massey, Chas R. Luce, Elmer Sothoron, Llewellyn Eliot, Clifton Mayfield.

Willard's Hotel has been chosen for the headquarters and special rates have been made for all interested in this meeting.

Many able papers have been promised and a very successful scientific meeting is assured. There will be a large and varied exhibition of Electro-Therapeutic apparatus in Willard's Hall during the meeting of the Association. Willard's Hall is well adapted for this purpose, as it not only adjoins the headquarters but communicates with it by a corridor, there is also a large entrance directly from the street. The Committee also promises a very pleasant social program, including a reception by the President of the United States, an excursion to Mt. Vernon, Arlington and Alexandria, a Buffet lunch to be served at Alexandria, an evening visit to the Congressional Library to be viewed under electrical illumination. Provisions have also been made to visit the War, State and Navy Department, the United States Treasury and other public buildings.

It is earnestly hoped that every fellow, Active, Honorary and Associate will be present at this meeting as we want to make it rank among the notable meetings of this Association.

$300,000 Art Exhibit.

One carload of pictures and a like amount of statuary has arrived at the Fine Arts Building at the First Greater America Exposition. Bills of lading for several carloads of art exhibits from New York, Boston, Chicago and Philadelphia have arrived. The value of these exhibits is fixed at something like $300,000. All this material will have arrived by the 12th of the present month. Work in this building is progressing with considerable rapidity and Superintendent Key states that he will have it completed by the 15th and ready for inspection.

The name, *Tri-State Medical Journal* has been changed to the *InterState Medical Journal.* The original name was derived from the Tri-State Medical Society which includes Iowa, Illinois and Missouri. The success of this excellent Journal has broadened beyond the limits of the three States and has, therefore, adopted a name commensurate with its growth.

Solar Heat.

Direct exposure to the sun's rays; employment in or living in hot and poorly ventilated offices, workshops or rooms, are among the most prolific causes of headache in summer-time, as well as of heat exhaustion and sunstroke. For these headaches and for the nausea which often accompanies them, Antikamnia will be found to afford prompt relief and can be safely given. Insomnia from solar heat is readily overcome by one or two five-grain Antikamnia tablets at supper time, and again before retiring. If these conditions are partly dependent upon a disordered stomach, two five-grain Antikamnia tablets with fifteen or twenty drops of aromatic spirits of ammonia, well diluted, are advisable. For the pain following sun or heat stroke, Antikamnia in doses of one or two tablets every two or three hours will produce the ease and rest necessary to complete recovery. As a preventive of and cure for nausea while traveling by railroad or steamboat, and for genuine *mal de mer* or sea sickness, Antikamnia is unsurpassed and is recommended by the Surgeons of The White Star, Cunard and American Steamship Lines.

Putrefactive Processes.

As an antiferment, to correct disorders of digestion, and to counteract the intestinal putrefactive processes in the summer diarrheas of children, LISTERINE possesses great advantage over other antiseptics in that it may be administered freely, being non-toxic, non-irritant and non-escharotic: furthermore, its genial compatibility with syrups, elixirs and other standard remedies of the Materia Medica, renders it an acceptable and efficient agent in the treatment of diseases produced by the fermentation of food, the decomposition of organic matter, the endo-development of fetid gases, and the presence or attack of low forms of microzoic life.

An interesting pamphlet relating to the treatment of diseases of this character may be had upon application to the manufacturers of LISTERINE, Lambert Pharmacal Co., St. Louis.

A Practitioner devoting especial attention to the Diseases of Children, says:

"In the treatment of Choleraic Diarrhœa we are safe, it matters not at what time we may be called, in administering some antiseptic medication, something which will prevent fermentation, and have a destructive effect upon the septic germs more than likely present in the alimentary canal. Happy effects are often secured by the use of LISTERINE properly diluted ; a favorite prescription is the following:

℞ Lambert's Listerine.
Glycerine (c. p.)
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Taking into consideration the component parts of LISTERINE, it impresses me favorably as a prophylactic and remedial agent for cholera, along with other intestinal disturbances. The eucalyptus, thyme, gaultheria and boracic acid which it contains are all antagonistic to germ life and oppose fermentation. The preliminary diarrhœa (cholerine, as it is called) may well receive teaspoonful doses of LISTERINE combined with the same amount of glycerine ; in fact, I should be inclined to recommend to the laity this combination as a prophylactic measure."

Local Application.

It may not be generally known that in addition to its marked curative properties when administered internally, Tongaline produces no less beneficial effects when applied locally in certain conditions.

Among the indications which call for the topical use of Tongaline are the inflamed joints of rheumatism, the enlarged articulations of gout and stiff and strained muscles from any cause whatever.

In fact the internal administration of any one of the Tongaline preparations, as indicated, given at short intervals with copious draughts of hot water, may be supplemented by the local application of Tongaline Liquid. What is very important to note is the fact that the same good results are invariably secured and the disturbing effects of internal medication upon an irritable stomach and sensitive nerves entirely avoided by the external use of Tongaline Liquid alone.

Utro-Ovarian Pain.

Prompt relief, unaccompanied by habit or untoward after-effect, is what the up-to-date practitioner desires most in these cases. If the pain is over the lower border of the liver, or lower part of the stomach or in short, be it headache, sideache, backache or pain of any other description caused by suppressed or irregular menstruation, it will yield to two five-grain tablets of Antikamnia. This dose may be repeated in an hour or two, if needed. For very prompt relief, it is advisable to crush the tablets and swallow them with a little wine, diluted whisky or toddy.—*Ohio Medical Journal.*

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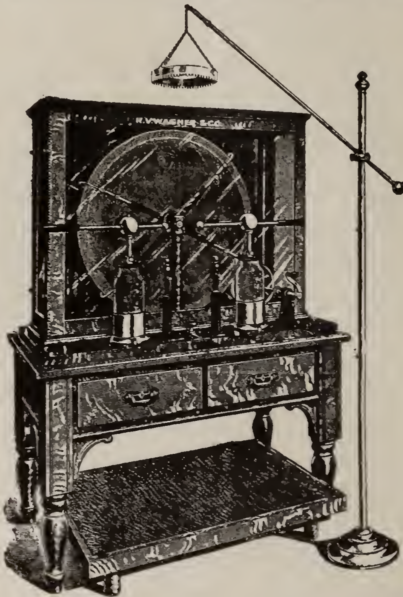

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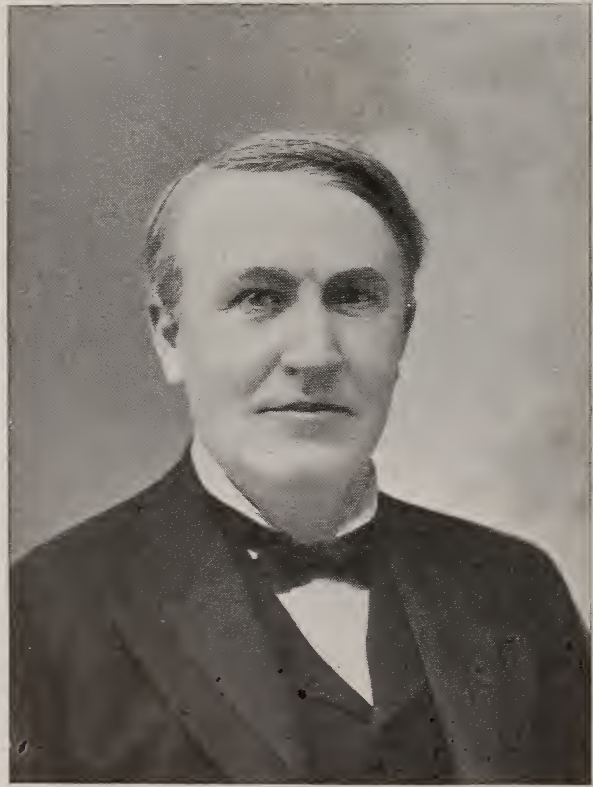

THOMAS A. EDISON.

The American X-Ray Journal.

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VOL. 5. ST. LOUIS, AUGUST, 1899. NO. 2.

The Ill Effects of Roentgen Rays As Demonstrated in a Case Herewith Reported.

This is the title of a paper read before the Medical Faculty of the County of Westchester, N. Y., May 1899, by Daisy M. Orleman, M.S., M. D. The article is reported in full in *The Medical Record*, and deserves to be read by physicians. It is the recital of a personal experience of a doctor who suffered so horribly so many months. It is probably the last great recorded act in a bugbear scare and will be remembered for this and because of its sensational nature and lucid description. Only the patient could have written so well. The imperceptible coming on of the insiduous injury, the full awakening to the realization of the impending disease, the hope of speedy recovery answered with oft repeated disappointment, the physical pain and mental anguish, the consultations, the going from place to place in futile search of a remedy reads with something of the same spirit that presses one on to read the personal experience of De Quincy and the Opium Habit.

Like the Bailing case in Chicago, many exposures were made of the man's injured leg, which was not in any way serious, in order to obtain an x-ray picture. In every instance there seems to have been failure. In each case the tube was near the unprotected flesh and the exposure of long duration. The first exposure was made in January, 1898, and the wounds which followed the repeated exposures lasting about two months, did not heal until near April, 1899.

After self inflicted medical advice proved useless the doctor consulted many physicians, surgeons, dermatologists and neurologists, notably Dr. W. T. Bull, of New York, Drs. W. N. Bullard, H. L. Burrell and Williams of Boston.

The remedies (?) used in the treatment consisted of alcohol, ointment of boracic acid, bichloride, lead, opium, ointment of zinc and lanolin, ichthyol ointment, balsam of Peru, castor oil, antiseptic solution, nitric acid, peroxide of hydrogen, aristol, nitrate of silver, cocaine, carbolic acid, sulphate of zinc, compound spirits of lavender water, hot bath, orthoform ointment, flax seed poultice, skin grafting, chlorinated soda wash, tincture of myrrh, rest and massage.

The doctor writes: A microscopic examination of a section of the tissues indicated a chronic inflammation characterized by a development of denser fibrous tissue in abundance. Infiltration of leucocytes in small numbers is seen through the fibrous tissue. The blood vessels were generally thickened and the lumina is narrowed as a result of the thickening of the intima. The base of the ulcer is lined by a thin layer of necrotic tissue. Dr. Bullard, the Boston neurologist stated that the underlying condition was a destruction of the terminal nerve fibres a state of atrophic neurosis. The pain of an intense burning character was excruciating and a liberal quantity of cocaine combined with carbolic acid failed to give relief.

The writer concludes: "In the treatment of such an injury it is essential strictly to observe the therapeutic value of local rest. Had I given this precedence in the beginning, when I found that the case was not proceeding satisfactorily after the due application of poultices and stimulating washes, under which there was no local evidence of repair and the wound remained stationary, I might have had a more speedy recovery. There were obviously two requisites in the treatment which effected the cure in addition to the local applications: viz., to overcome the pain and to maintain the limb in a perfect state of rest. I found massage of the limb during the latter part of the treatment, twice daily, to be of inestimable value in maintaining good circulation."

The wise teachings of the great Hilton, written 25 years ago, "Rest and Pain," is too little heeded these tireless days; and the antiseptic and anodyne effect of electric currents too little known to be used.

Treatment of Lupus by Roentgen Rays.

By C. Thurston Holland, M. D., Superintendent of the X-Ray Dep't Royal Southern Hospital, Liverpool. Read before the Roentgen Society. Abstracted from full text in *Archives of the Roentgen Rays:*

Dr. Holland has made a great many exposures to the x-rays and has taken 725 radiographs which he has kept. He has always used the simplest apparatus—an accumulator, a coil and a tube. The exposures have been from a few seconds to one hour. The distance of subject from the tube ranged between 4 and 14 inches without any attention whatever given to protect the body. No accident has come from the work not even the loss of a hair or redness of the skin.

The first case of lupus treated presented a chronic, irregular, punched-out tubercular ulceration of the foot which had lasted for upwards of eleven years. Walking was almost impossible as the foot was painful and the sore discharging freely. The usual treatment had been employed, together with scraping and caustics, with the unsuccessful results in such cases. All treatment was stopped except boracic ointment and the foot was exposed to the x-rays nineteen times within 58 days. A ten-inch coil was used and the tube placed 4½ inches from the foot with an average duration of exposure of fifteen minutes at each treatment. The first exposure was made April 18, and by May 24 the foot was much improved, and by the 31st all discharges had ceased. Jan. 14, when x-ray treatment was stopped, there was no pain nor discharge. The sore had not entirely healed and treatment was later resumed.

Case second is a boy of 16 years of age in whom a large lupus covered the left face and ear. It was of five years' duration. All the usual remedies and methods had been employed in vain. Seventeen exposures to the x-rays were made between April 18 and June 14, fifteen minutes being the average duration of each exposure. The platinum anode was kept red. After the eleventh application of the rays the lupus had mostly dried and the patient went about without any dressing. On Oct. 1, the boy was showed to the dermatologist of the Liverpool Medical Institute who pronounced the case cured.

The third case of lupus was in a boy of 18 and the ulcer had been on the face eleven years. The variety was dry and did not yield to the x-ray treatment until several applications had been made and after full discharge had been established. After this the case improved.

The fourth case was a young woman in whom the entire face, nose and lips were involved in the lupus ulcer. It was of a malignant type. Scraping under chloroform and pure carbolic acid had been used. Rapid relapse followed each of these operations. She was not cured by the x-rays but was greatly benefitted. Dr. Holland is of the opinion that the x-rays stimulate the tissues in and around the diseased area which enables them to resist successfully the further spread and growth of the disease.

Photographs of the two first cases were made before and after treatment and are shown in the *Archives of the Roentgen Rays* for May.

Can Gallstones Be Radiographed?

Dr. H. H. Hogan examined *one* patient with the x-rays who presented symptoms of gallstones and found none according to *The New York Medical Record.* The doctor exposed six or seven gallstones to the x-rays and noticed but slight shadow; when in flesh he found them less opaque than the tissues would show about bone. One stone given him by Dr. Burchell, of the Belleview Hospital cast a decided shadow through hepatic tissue. This was supposed to be due to the excessive lime and less chlolesterine in the stone. However, Dr. Hogan thinks that the x-rays have no value in gallstones, his conclusions apparently being drawn from the one case cited. More than 18 months ago the writer distinguished gallstones in a patient, a woman 35 years of age. Dr. Schultz, of this city, happened to be in the office at the time and the doctor almost immediately recognized the shadow. Dr. Bernays accepted the radiographic and fluoroscopic diagnosis and without further inquiry operated. Several gallstones were removed and the patient made a happy recovery.

A Badly Treated Fracture.

Dr. W. D. Treavis, of Covington, Ga., in connection with an article read before the Medical Association of Georgia, April, 1899, showed a radiograph of the forearm of a girl nine years of age, which had been fractured two years before. The bones were put in apposition but the dressing consisted of bandages too tightly bound about the forearm and splints and too long retained causing curvature of the bones, union between the radius and ulna, sloughing, adherent skin, drop wrist and contracted fingers. Many months after the deformity was recognized the bones were separated and with the aid of electricity and massage the entire member has become quite useful. The forearm became somewhat dwarfed in all directions. The case is of interest to the surgeon using the x-rays because of the views that were made during the latter part of the treatment. Dr. Travis did not see the case until nearly two years after the accident.

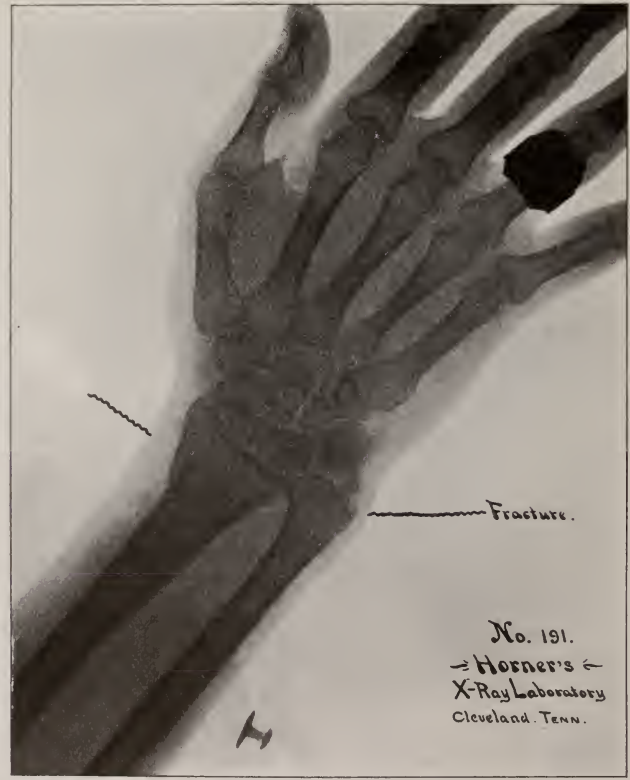
Stone In the Kidney.

In the *Archives of the Roentgen Rays* for May, Mr. Mackenzie Davidson has had printed a radiograph of a stone in the right kidney which shows with remarkable clearness. The Crookes tube used had an osmium anode and the coil used gave a 10 inch spark. The tube was distant from the plate 15 inches, and two pictures made, the second with a tube displacement of 3 inches for localization purposes and to get a stereoscopic picture.

The duration of the exposure upon one plate was two minutes and twenty-six seconds and upon the other two minutes. The clear definition of the stone is due, according to Mr. Davidson, to exposing the plate only while the patient was in the same phase of breathing. Motion like that attended with respiration blurs the picture. Three other cases are mentioned in this same connection in which the stone was easily seen and its exact location determined.

Colles' Fracture.

The radiograph was taken three months after the accident. Three physicians saw the case during treatment and united in the opinion that there was no fracture at the lower end of the radius. Some crepitation was distinguishable about the joint which was attributed to fracture of the styloid process of the ulna, and undoubtedly this was correct. The radiograph presents a distinct line of fracture across the distal end of the radius. This fracture was not attended with deformity. It was in a condition we frequently meet with in practice and often not appreciated—the parts being dressed as an ordinary sprain. Surgeons are familiar with the deplorable results of the practice resulting from failure of correct diagnosis in these cases. In this instance, fortunate for the attending doctors, their diagnosis confirmed crepitation which urged them to apply a permanent dressing.



Professor Horner, the radiographer, of Cleveland, Tenn., has made use of this case as an argument for the early employment of the x-rays in case of any fracture. From a surgical and medico-legal aspect the point is certainly well taken. If injuries were radiographed, when possible, before treatment and at the time permanent dressings were applied and again when the patient was discharged there would be less use of "physicians in the west," as mentioned in the *Journal of the Am. Med. Ass.*, of "owning no property, their home being in the wife's name as a protection against suits for malpractice.”

Bullet In the Pelvis.

A seven-year-old boy, of Spartansburg, Pa., was accidentally shot, by his brother, with a large caliber bullet. Probing was resorted to—the “Obsolete probe,” “the accursed instrument,” “the fatal probe,” as it is variously called by the careful surgeon, with nil results. The boy was taken to Dr. Pitkin, of Buffalo, and the bullet located with the x-rays. The missile entered the left groin and stains or fragments from the lead indicates its course across the pelvis to the point of lodgment near the greater trocantar of the right thigh bone.

Surgeon Major G. H. Torney, U. S. A., equipped the x-ray laboratory of the Hospital Ship Relief with the Dennis fluorometer, Surgeon W. M. Gray being in charge of the laboratory. W. G. Borden, Captain and Assistant Surgeon U. S. A., has placed this necessary adjunct to x-ray diagnosis, in the U. S. General Hospital at Washington.

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Doctors Trudeau and Baldwin, owners of the Saranac Lake Sanitarium, N. Y., have ordered a 16-plate machine for their institution. This is another evidence of the good management of the Saranac Lake Sanitarium.

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The management of the Southern Pacific Railway has taken advanced steps in railroad surgery by supplying the Hospital at San Francisco with a 16-plate machine together with motor and all accessories.

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Dr. L. D. V. Judd of 3603 Pomelton Ave., Philadelphia, has put in his office a 16-plate machine.

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Dr. H. M. Schall, of Rochester, N. Y., Dr. Henry Chandler, of Baltimore, Md., and Dr. Eber W. Gurley, of Clevelsnd, Ohio, have recently put in their respective x-ray laboratories the Dennis fluorometer.

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Dr. H. W. Latham of Latham, Mo., has recently put in his office an 8-plate machine.

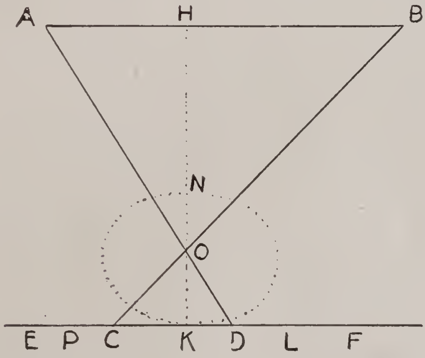
State College of Kentucky, }
School of Physics, }
Lexington, Ky., July 21.

Editor American X-Ray Journal:

Dear Sir:—I send the following method that may be used in locating a bullet or other foreign object in the human body.

This method is readily understood by reference to the diagram.

Let the area enclosed by the dotted line represent a cross-section of the human body or of that member of the body which contains the foreign object O. First let the position of O be determined approximately by photo or with the fluoroscope. Then with the body in position on the table E F, place the source of the x-rays at B, so that the shadow of O will fall at some point C on the photo plate P L. Protect the plate to the right of C, or from K to L, from the x-ray effect with a sheet of metal or a pane of glass; and use the rays until the shadow of O is fixed at C. Stop the current and shift the tube parallel with the plate to same point A. A B, the distance the tube holder is moved, can be accurately measured. Also move the sheet of metal until the plate is protected



to the left of D. Turn on the current and fix the shadow of O at D. After developing the plate, C D, the distance between the centers of the two shadows, can be accurately measured. Also measure H K, the perpendicular distance of the x-ray source from the plate. Then the distance of O from the plate is given by

$$O\,K = \frac{C\,D \times H\,K}{A\,B + C\,D}$$

The measurements required in the operation, C D, A B, H K, can be easily and accurately made. Care should be taken that the object O and the plate P L remain in the same positions while the exposures are being made.

This method is very accurate, though in some cases other methods might be preferable.

It will be observed that H N or K N can also be easily measured and the value of O N then determined.

This method may be used with the photo plate horizontal, vertical or oblique.

In some cases this method may be more satisfactory than to locate the object by finding intersecting lines with the fluoroscope. Yours Truly,

M. L. Pence, M. S.
108 Marino St.

Visibility of Roentgen Rays.—Mr. Dorn, who has studied the effect of Roentgen rays on eyes, has recently made experiments with totally color-blind persons, the results of which are described in the "*Wied. Ann.*," No. 13, and abstracted briefly in the Lond. "*Elec.*" Feb. 3. One of them saw the Roentgen rays with an almost painful briliancy in the form of an elliptical ring. He concludes that only the rods on the retina, and not the cones, are sensitive to Roentgen rays. The experiments are claimed to show that the mechanism of perception for the Roentgen rays is practically identical with that for ordinary light.—Dorn. Lond. "*Elec.*"

ROENTGEN RAYS.

BY PROF. W. C. ROENTGEN.

If an opaque plate be arranged between the vacuum tube and a platino-cyanide-barium screen, even pretty close to it, there is some fluorescence, which is cut off when the air situated laterally is sheltered from the impact of Roentgen rays by a thickness of lead. The effect is not due to the bending of rays; but the air, when struck by the rays, sends out Roentgen rays in all directions; so that if our eyes were sensitive to these rays, a vacuum tube would appear like a lamp in a room filled with tobacco smoke, and possibly the light from the tube and that from the air would have different colors, though there are at present no means of testing this question (whether the air acts by simple diffused reflection or as a quasi-fluorescent substance), for the rays from the air are also photographically active.

For comparative measurements the author uses a simple vertical plate of lead along the mid-line of a table; the fluorescent screen is placed at right angles to this, so that half the screen looks toward the left and half toward the right side of the partition. The two tubes to be compared are placed one on each side of this partition, and each then affects only one-half of the screen. In using this it is found that the tubes are very inconstant; they are sensitive to irregularities in the make and break (worse with Foucaults than with Deprez's contact breaker;) and when the outbursts of Roentgen radiation follow one another so rapidly that the eye cannot detect any want of continuity in the phosphorescence on the screen, the brightness of the screen depends on the intensity of a radiation from the platinum plate of the discharge tube, on the kind of rays reaching the screen, on the distance between the screen and the tube, on the absorption undergone by the rays before reaching the screen, on the number of discharges per second, on the phosphorescent afterglow of the screen, and on the radiation to the screen from surrounding objects. From a flat plate the radiation is equal in all directions up to about 80 degrees from the normal, and the difference is only well marked at between 89 degrees and 90 degrees. The mode of experiment consisted in flexible photographic films bent to a half circle half surrounding the source; there is no ascertainable difference between the radiations at different angles; the photographic effect increases, except in extreme cases, with the angle between the source of rays and the photographic plate. There is an analogous case of equality in all directions in optical fluorescence. Drop fluorescein into water in a square tank illuminated by white or violet light, and the walls of the columns of the fluorescein solution appear the brightest, i. e., where the angle of emanation of the phosphorescence light is the greatest. Stokes has explained this through the fluorescence light being much less absorbed by the fluorescein solution than the exciting rays are. So here, the exciting cathode rays are much more absorbed by platinum than the induced Roentgen rays.

The sharpest shadows are obtained by tilting the platinum away from parallelism with the photographic plate through not more than 80 degrees; and the impression is then the most intense. In the absence of disturbing effect from the air, and on condition that the radiations remain of the same kind, the brightness of a fluorescent screen varies inversely as the square of its distance from the source.

Splitting a solid into layers makes no difference in its transparency; nor does putting it nearer to or farther from the screen. Rays which have traversed one thickness traverse another more readily (in proportion;) so that the specific permeability (fraction of radiation let through a layer of unit thickness) is greater the thicker the object. When two plates of different substances are equally permeable, this equality disappears if the plates are equally thickened or thinned; with plates of Pt. 0.0026 mm. and of Al 0.0299 mm. thick, one Pt = six Al; but two Pt = sixteen Al. Other similar numbers are given for other tubes. The relations between the equivalent thicknesses of two substances vary with the thickness and the nature of the material (e. g., the walls of the vacuum tube) traversed by the rays before reaching the screen. The author uses a platinum foil, 0.0026 mm. thick, with fifteen holes in it, closed respectively by single, double, . . . fifteen fold thicknesses of aluminum, each of 0.0299 mm. thickness. When this is interposed, a glance shows which thickness of aluminum is equal to 0.0026 mm. of platinum.

The corresponding number of aluminum thicknesses is called the "window number," the apparatus being called a "platinum window." Example: With direct radiations the window number was 5; on interposing 2 mm. soda glass, the window number became 10; the rays filtered through the glass found it relatively easier than before to traverse the aluminum. Rays sent through this platinum window and then through a dozen photoraphic films indicated the window number 10 for the first film and 13 for the last.

Conversely, one and the same substance is differently permeable to rays from different tubes; lowest vacua, least potential of discharge, "softest" tubes, least power of penetration; highest vacua, highest potential of discharge; "hardest" tubes, greatest power of penetration. With the former, window number say 2; with the latter may be beyond 15. With the former, simple shadows of the hand; with intermediate exhaustions good bone shadows; with the last bones also permeable. With one and the same tube the quality and penetrating power of the rays depend upon the action of the contact breaker (which fluctuates), the length of spark gap paralleled to the tube in the secondary circuit, the introduction of a Tesla transformer, the amount of vacuum, and other uninvestigated changes within the tube itself. Putting a tube on the pump at the lowest sufficient vacuum, with small spark gap parallel to the tube, the tube is very "soft," the rays absorbable, and the window number small. Putting in a Tesla transformer, or a spark gap in series, the tube is "hardened." With a Tesla transformer in circuit, with narrow tube and wire electrodes, the rays are given off in air at 3.1 mm. Hg., and at still lower vacua in hydrogen.

The highest vacuum under which the rays can be given off is beyond 0.0002 mm. Hg. As the vacuum is increased, the spark gap must be at the same time lengthened; and when the tube is so "hard" that the spark gap has to be more than 20 cm. long, the rays will go through 4 cm. of iron. The tube will also become harder through its own continued action; so "hard" that a shadow photograph of a gunlock at 15 cm. distance can be taken in 12 minutes—a relatively long exposure, because the rays go through the photographic film instead of affecting it. This hardening is due to self exhaustion, and to some change in the electrodes themselves.

A tube, if too hard, can be softened by letting in air, by warming it, by reversing the discharges, or by driving very powerful discharges through it. In the last case, the necessary potential of discharge becomes high, but the rays are very absorbable and the window numbers low. It appears that the kind of rays emitted depends on the mode of discharge, however this may be attained. The same mode of discharge would give the same Roentgen rays, even at relatively high pressure. The quality of the rays is not affected by the strength of the primary current, assuming that the contact breaker acts equally at all current strengths; but their intensity is affected. Therefore, (1) the radiations from a tube are mixed, and differ in absorbability and intensity; (2) the composition of the mixture depends on the mode of discharge; (3) different rays are absorbed by different substances; (4) cathode rays resemble Roentgen rays in many respects, and the two discrepancies (a) difference of absorbability, and (b) the permeability to the two kinds of rays according to the density of the substance not following the same law, may be found bridged over by further researches leading to the discovery of rays of intermediate condition, say the Roentgen rays in ultra soft tubes and extremely thin windows, or the cathode rays in ultra-hard tubes.

Photographic results follow the fluorescent screen pretty closely, particularly with soft tubes; but with hard tubes the window number seemed a little lower than with a screen. When a hard and a soft tube bring the two halves of the fluorescent screen to the same brightness, a photographic plate put in place of the screen is less affected by the rays from the hard tube; in the latter the rays go through the film, and will go through 96 films and impress the last one while the first is scarcely overexposed. For this special reason, hard tubes require longer exposures; very soft tubes need longer exposures on account of their feebler intensity.

In a tube in action, Roentgen rays come not only from a minute area on the anticathode, but, more feebly, from the whole plate and a part of the walls of the tube. Cathode rays go in all directions from the cathode, but only feebly except along the axis. When the tube is hard and the platinum anticathode very thin, Roentgen rays start in considerable quantity from the back of the latter; and in very hard tubes the point which most emits Roentgen rays can be shifted away from the anticathode by a magnet.

Continued experiments show no difference in the permeability of any crystal according to the direction of the axis. It is the case that the eye can sometimes perceive the presence of Roentgen rays; this is due to the setting up of fluorescence in the retina; and with hard tubes, looked at through a narrow slit in a lead sheet, it is not difficult, by moving the slit, to get changing luminous figures. Nothing which may really be referred to diffraction has been discovered, though repeatedly sought for; apparent instances have all been found to be otherwise explicable.—*Electrical Engineer.*

THE ENERGY OF ROENTGEN RAYS.

BY DR. J. G. MCPHERSON, F. R. S. E.,
Science Examiner in the University of St. Andrews.

Since the marvellous properties of the Roentgen rays were discovered, very many experiments have been made to bear upon their application to physiology and surgery. Dr. Polland's Atlas of the development of the formation of the bones of the wrist from birth till seventeen years of age is one of the most startling of the recent successes of the process; and this has overturned to some extent the old theory of the formation of these bones.

There has been, however, as yet but little done to determine the *energy* of these rays. The Rev. Alexander Moffat, B.SC., has been studying the subject in Erlangen, and has submitted to the Royal Society of Edinburg the result of his investigations.

A. Rotti was the first to attempt to determine the duration of the Roentgen rays. He used a Ruhmkorff coil with a rotating interrupter to make and break the current in the primary circuit. On the interrupter he mounted a photographic plate, and in front of it had a screen of lead with a slit in it. The Roentgen rays were made to pass through the slit and make a photograph of it on the plate. From the amount of broadening of the photograph he found that the duration of a discharge was about $\frac{1}{600}$ second.

Dr. Trouton, of Liverpool, adopted the method of rotating a zinc-toothed wheel between the Roentgen lamp and the photographic plate. A photo of the moving teeth was secured by making one interruption of the primary current in the induction coil, thereby letting one discharge pass. The duration of the radiation was determined by the departure from sharpness of outline of the photo; and he concluded that the duration of a discharge was from $\frac{1}{800}$ to $\frac{1}{10000}$ second. M. Colandeau, adopting the same method, found the result to be about $\frac{1}{1000}$ second.

M. Morize adopted Rottis principle. He fixed the plate to one end of the axle of the electrometer, and at the other end he placed a toothed wheel which interrupts an electric current, and makes a contact which registers itself on a chronograph band. From the broadening of the image of the slit he found the duration of the discharge to be a little over $\frac{1}{1000}$ second.

Mr. Moffat has now determined that this figure is far too low. In fact he proves that the real duration is about a tenth part of that determined by Colandeau and Morize. He used an optical bank with a screen of barium platinocyanide and the Roentgen lamp at one end; an amylacetate lamp, as a source of light, being at the other end to note the standard of comparison. Between these was a movable photometer.

In order to obtain as strong Roentgen rays as possible, he introduced an air spark into the circuit, thereby driving away the particles of dust in the air and making the discharge more sudden. The Roentgen lamp and the spark interrupter were enclosed in a box, the lamp being fixed near one side. At the place where the rays from the anti-cathode were to be transmitted, a small hole was bored and covered with thin black paper. On the other side of this paper the screen was fastened. In front of the screen was fixed a piece of cardboard with a small hole in it, and through this the light-emitting surface of the screen appeared.

The light from the test lamp had to be weakened, because the light proceeding from the screen was very faint. This was done by putting the lamp inside a wooden box. A hole was made in front of the box and covered with translucent paper. In front of this was placed a piece of green glass. For a photometer he used simply two mirrors set at right angles to one another; in this way a very little of the light was lost. To determine the quantity of light emitted by the translucent paper from the amylacetate lamp, he put at one end of the optical bank a lamp, and at the other end the box with the translucent paper thus illumnated. He found that the light emitted by the paper was one-twentieth of that of the lamp.

He then removed the translucent paper and determined the extinction coefficient of the green glass by measuring the intensity of the light transmitted by them in comparison with that of the lamp alone. He found that the intensity of the light coming from the translucent paper, when weakened by transmission through the green glass, was about $\frac{1}{50000}$ lamp.

Now, the light of the lamp is emitted during the whole time it is burning, but the Roentgen rays only during very short intervals of time. To determine the upper limit to the duration of these intervals, Mr. Moffat put in front of the screen an opaque screen with a small vertical slit, and examined the image of the slit in a rotating mirror. The slit was three millimeters broad, and the mirror was exactly opposite it at a distance of 27-5 cm., revolving at the rate of about ten revolutions per second. Now, he saw that the image was broadened one-tenth part. Accordingly, the duration of a discharge must have been about $\frac{1}{2}\times\frac{1}{10}\times\frac{1}{10}\times\frac{3}{275}\times\frac{7}{44}=\frac{1}{120000}$ second.

By a series of successful experiments Mr. Moffat has averaged the duration of a discharge of the Roentgen rays at $\frac{1}{100000}$ second. This, at least, is the upper limit.—*Knowledge*, London.

Correction of Normal Divergence and Divergence By Position of The X-Rays.*

BY HEBER ROBARTS, M. D., ST. LOUIS, MO.
Editor of The American X-Ray Journal.

To be able to do useful x-ray work four surmountable barriers confront us; that is, four propositions that must be mastered before we should assume to make a positive diagnosis by the aid of the x-rays.

1. A generating apparatus and accessories capable of showing such things as the hip joint, tumors of the brain and the right and left heart.

2. The fluorometer, which, with mathematical precision, corrects distortion.

3. Knowledge of x-ray technique; knowledge of anatomy and pathology.

4. Ability to desynonomize and specialize the varying shadows on a screen.

The second proposition will occupy our attention at this time.

Prior to the public announcement of the discovery of the x-rays, Prof. Roentgen had observed that the emanations from a Crookes' tube went on to infinity; but on leaving the tube this radiant energy diverged with constancy and with uniformity. At the Wuerzburg Physio-Medical Society in December, 1895, when the preliminary report of the discovery of the x-rays was made, it was very little thought that it would ever be used by the diagnosticians. As early as February of the following year, however, it was conceded by those acquainted with the subject that the x-rays had a permanent place in diagnostic medicine. It was already being employed to locate bullets and other foreign objects impervious to the rays. But when surgery was done, for the purpose of removing these opaque substances, the objects were found to be increased in size, and when far removed from the surface, so much distorted as not to be recognizable. Divergence, therefore, became a bugbear, and physicists everywhere were unsuccessful in devising means for its practical correction. This element of divergence we speak of as normal, because of its constancy and primarily emanating from the generating source.

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* Read before the Academy of Medicine, St. Louis, May, 1899.

At a single point on the platinum disk, where the cathode rays impinge upon the anode, is the source of the Roentgen rays, and at this point, the rays emerge, going out at an angle diverging thirteen-sixteenths of an inch in every sixteen inches of travel. If we have an object to examine, as for instance, a tumor of the brain, located in proximity to the Pineal gland, it will be distant from the fluorescent screen three inches. Then the tumor will have the appearance of being three-sixteenths of an inch larger than it really is. This defect in the picture may be sufficient in some instances to lead the surgeon into erroneous judgment, and preclude what might have been a safe operation. But with the fluorometric readings of today it is a simple matter of mathematics to determine the actual size of any body shadowed on a screen.

A greater difficulty which the surgeon had to encounter was the distortion occasioned by position. This condition made the diagnosis treacherous, uncertain and sure to misguide. The cause of this greater divergence was made more apparent by the discovery by Mr. Edison of the fluoroscope. An x-ray picture is a shadow without thickness on a fluorescent screen. The Crookes' tube is the emanating source of energy, as light is from a candle. The object to be seen must be interposed between this tube and the fluorescent screen. The shadow will be distorted precisely in the same manner as an object interposed between the candle and white wall. We can well recall the grotesque pictures we made on the wall with the fingers of the hands in childhood days or were made by grown persons for our amusement. They practically illustrate the errors possible in x-ray work of to-day, in the possibility of distortion—either designed or accidental. This element of divergence is said to be by position. It is really not a divergence but a distortion.

In the case of the tumor of the brain previously mentioned, divergence of the rays were shown to be unalterable and, therefore, the size of the object easily calculated. Now it is necessary to locate the tumor with precision, if diagnosis and surgery are needed. If the body is fixed the object will appear to be fixed also; but the slightest rotation will shift the shadow and change its outline, giving the appearance of fixation at another site. This movement can be effected at will. Should the object to be examined lie near the screen, rotation of the body will not be attended with very great distortion; but greatly so, if far removed.

It is in this manner that erroneous opinions have become current; to the effect that a sound bone may be made to appear fractured and a fractured bone sound. In neither of these cases can this be done unless some extraneous device is employed. Fractures and dislocations can, however, be made to appear grossly exaggerated, or such malcondition may be made to appear in almost normal position. An operator ignorant of anatomy and of the principles of divergence and distortion may do either of these innocently. This is a vital point on which medico-legal cases will hinge.

It became apparent that unless distortion by position and normal distortion could be corrected it would be unsafe to employ this means in diagnosis for the surgeon and worthless, if not dangerous, in courts of law. In the spring of 1897 Mr. Dennis, of New York, conceived of a method wherein the parallelism of the x-rays could be effected, and made the device to this end for practical purposes. Mr. Puffer, of the same city, called the device a fluorometer, because it measured the shadow on a fluorescent screen.

The fluorometer consists of right angle devices impervious to the x-rays, together with wooden supports and an adjustable table. It provides:

First, a perfect shadow, when thrown on a screen or sensitive plate.

Second, elimination of the distortion resulting from radiant energy known as the x-rays.

Third, the normal distortion and distortion by position having been eliminated, the fluorometer provides an accurate cross-section of the body and supplies an absolutely correct right angle, at the intersection of the lines of which the foreign object will be found in the body.

As a final conclusion it may be stated that without the evidence of a fluorometer having been used, clearly shown by its own shadows in the radiograph, no x-ray picture should be admitted as evidence in any court.—*American Journal of Surgery and Gynecology.*

TRANSLATIONS.

BY FRANK RING, M. D.

Revue Internationale d' Electrotherapie et de Radiographie, Paris, publishes an interesting index of progress in x-ray work, from which the following points have been selected:

Radioscopy of the Lungs; the Danger of Misinterpretation by Those Who Employ This Method of Diagnosis (Abrams) Phila. M. J.

A Discussion on the Uses of the Roentgen Rays in Ophthalmology. (British M. J.)

A Case of Nephritic Stone Diagnosticated by Means of the X-Rays, and found upon operation (*Munch Med. Woch.*) Alsberg.

Upon the Treatment of Lupus and Chronic Eczema with the Roentgen rays (Albers Schoenberg) (*Forscher, a. d. Geb d Roentgenstr, Hamb.*)

Surgical Applications of Radiographie, by Jeannel Marie (*Arch Prov. de Chir.*)

Gunshot Wound of left Kidney; Immediate Laporotomy; Secondary Radiography and Extraction of the Ball; Perineal Drainage; Preservation of the Organ; Recovery. (*Gaz. de Hop*, Paris.)

Chronic Tubercular Peritonitis, which had been treated without results, by the usual methods; Radiotherapy; Recovery. (Ausset et Bedart, in *Bell d. l. Soc. Centr. d. Med. du. Nord. Lille.*)

Roentgen Rays and the Diagnosis of Tuberculosis. (Beclere, in *Bull. Med.*, Paris.)

Roentgen Rays and the Displacement of the Left Pleura. (Beclere, in *Bull. et Mem. Soc. Med. d. Hop d Paris.*)

The X-Rays in Spina Bifida. (Beck, in *Med Recr.* N. Y.)

Upon the Changes in the Skin Arising From the Influence of the X-Rays. (Behrend, in *Berl Klin Wochenschr.*)

A Bullet in the Brain, Located by the X-Rays. (E. Von Bergman, in *Arb. a. d. Chir. Klin. d. k. Unir*, Berlin.)

Effect of X-Rays Upon Tuberculosis. (Bergoine et Tessier, in *Arch d Elect. Med.*, Bordeaux.)

New Measuring Apparatus for the Roentgen Rays. (Biesalski, in *Ann. d' Electrobiol*, Paris.)

Case of Removal of Bullet From Body of the Axis After its Location by Skiagraphy. (Bird, in *Intercolon.* M. J. Melbourne.)

Acquired Oval Oblique Pelvis; Radiography. (Bonnaire, in *Bull Soc d' Obst de Paris*.)

The Roentgen Rays in the Diagnosis of Pulmonary Tuberculosis. (Bouchard and Claude, in *Am. X-Ray J.*)

Wound in the Eye by a Grain of Lead; Recognition of the Projectile by Radiography. (Bourgeons, in *Un Med. du Nord-Est*, Reims.)

A Case of Gunshot Wound of the Brain. Removal of the bullet after recognition of its site through radiography, together with general remarks upon the treatment of gunshot wounds of the head. (Von Burkhardt, in *Med. Corr. bl. d. Wurtemb.*)

The Movements of the Stomach Studied by Means of Radiography. (W. B. Cannon, in *Porton Med.*)

[CONTINUED.]

The American Electro-Therapeutic Association.

With the near approach of the annual meeting of the American Electro-Therapeutic Association, to be held on September 19, 20 and 21, in the city of Washington, under the Presidency of Dr. F. B. Bishop, the Local Committee of Arrangements is redoubling its efforts to make it a success. Many electrical manufacturers will be represented in the Exhibit Hall, and information will be freely given. Papers have thus far been promised from Drs. R. G. Nunn, A. D. Rockwell, Margaret A. Cleaves, F. J. Leviseur, Walter White, Robert Reyburn, G. A. Carson, C. O. Files, J. H. Kellogg, John A. Licthy, W. W. Scheppegrell, L. Howe, E. Wende, F. B. Bishop, Robert Newman, W. J. Herdman, G. B. Massey, and Profs. Bergonie of Bordeaux; Apostoli and Dolbear of Paris.

With such authors a successful meeting must result.

LLEWELLYN ELIOTT, M. D.,
Press Committee.

PROF. A. C. BERNAYS, of St. Louis, Mo., has resigned his chair in the Marion-Sims College of Medicine, and will devote three and one-half hours each day in the future towards teaching practical surgery to private classes of graduates in medicine.

Details and prospectus can be had by addressing his manager, Dr. Frank M. Floyd, 612 Union Trust Building, St. Louis, Mo.

Sight-Seer's Headache.

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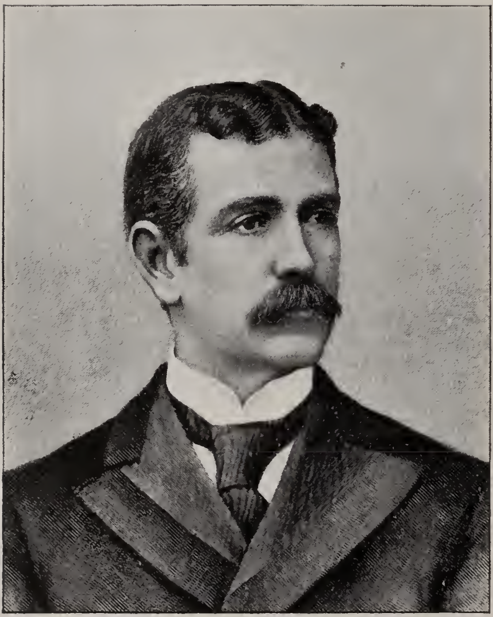

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The American X-Ray Journal.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

VOL. 5. ST. LOUIS, SEPTEMBER, 1899. NO. 3.

THE WEHNELT ELECTROLYTIC CURRENT INTERRUPTER.

BY PROF. ELIHU THOMSON.

In response to the suggestion in *The Electrical Engineer*, the writer made some experiments with the interrupter of Dr. Wehnelt, based upon the description published in the issue of Feb. 16. It is a most interesting and effective device, the acme of simplicity. The results it gives are truly quite remarkable. For the guidance of others some of these are referred to later on.

To construct an interrupter, one needs only a tumbler of battery acid (sp. gr. 1.20), a piece of platinum wire, say, .3 to .5 mm. in diameter and 2 centimetres long, a piece of glass tubing about 10 centimetres long, a piece of sheet lead, say, 3 centimetres wide and 15 centimetres long, with a wire or binding post attached.

The glass tube is drawn down, the platinum wire sealed in so as to project about 1 centimetre, more or less, from the end of the tube. It also projects into the tube and the tube is bent a short distance from its end to a right angle. The mercury is poured in and a wire dipped into the mercury. The lead sheet and the glass tube are then immersed in the acid in the tumbler and the whole is ready for use.

The utility of the mercury is to keep the wire cool within the tube and thereby to prevent cracking at the seal. No mercury is, however, needed, as the connecting wire (or better a cable) may be run down the tube so as to touch the platinum, and a few drops of solder then melted in to unite them. The conductivity for heat of the cable, if of fair size, and the mass of the solder, serve the purpose of the mercury, and can not, of course, be spilled. The sketch, Fig. 1, shows this device in working order. If it is to be worked for a long time it is well to immerse the tumbler in an outer vessel of water to keep the acid cool.

The platinum points and tubes bearing them are so easy of construction that a set of three or more may be provided and hung in the same vessel of acid, and switches provided to change from one to the other or to couple them in multiple opposite the same lead plate cathode. The several platinum points will vary in the particulars of extent of surface exposed to the liquid. One of them may have, for example, a wire of .2 mm. diameter projecting only 1 mm. In another the wire may be somewhat larger and may project from the glass seal 3 mm., etc.

Connecting one of these interrupters in series with a primary of an induction coil, or with several such coils in series connection, the whole being put across the mains of a 110-volt circuit, one witnesses a surprising display. The fierce discharge between the secondary terminals prove not only the rapidity but the sharpness of the interruptions. If the secondary terminals be not too far apart the discharges form a flaming arc, accompanied by a loud note, not altogether musical, but indicating a definite pitch. With the terminals farther apart this may be replaced by a torrent of sparks, and when they are still further apart the terminal wires are aglow with blue discharges.

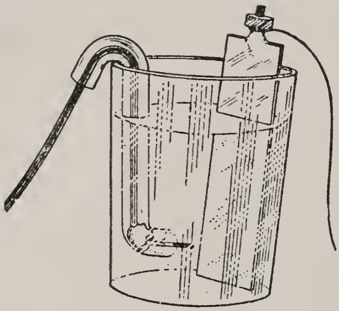
FIG. 1.

Putting the usual jar condensers on a coil which normally gives a torrent of sparks seven inches in length, causes shortening of the spark distance as in ordinary cases, but the effect becomes terrific. The noise is deafening and the white stream of condenser sparks lights up all the objects around with a continuous intense whitish blue light.

The secondary discharges tend to a unidirectional character when the spark length is such that individual discharges or sparks are obtained at each interruption without jars or condensers, but the arc when formed between the terminals is doubtless an alternating discharge, at least in part.

The interruptions are very sudden, while the increase of the primary current after each interruption is dependent largely on the inductance of its circuit. The rate of change is therefore greatest at the breaks, and the secondary voltage correspondingly greater when the breaks or interruptions occur than when the current is rising in the primary.

As pointed out by Dr. Wehnelt, the interruption of current occurs upon the attainment of a certain current density at the platinum anode surface. This attainment of a certain current density is dependent on the time constant of the circuit or upon its inductance. The higher the impressed voltage also, the less the time taken in reaching the limiting or interrupting value of the current.

To increase or decrease the speed of interruptions then we may:

1. Vary the area of platinum wire exposed to the liquid bath.

2. Vary the inductance of the circuit, as, by adding or taking out coils, or by sliding cores within coils, etc.

3. Vary the impressed voltage.

If we lessen the platinum area, the rate of interruption rises accordingly, because with other conditions the same it takes less time for the current to reach the then smaller limit of value.

If we increase the inductance greatly the interruptions may be brought down to but 10 or 12 per second, or probably far lower than that. On the other hand, a wire core with a few turns of copper wound around it may give an inductance so low as to result in enormous speeds of interruption.

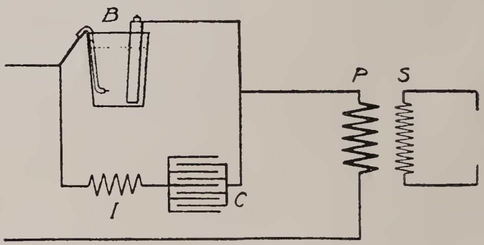

FIG. 2.

Indeed it is not at all difficult to attain speeds which, judged by the pitch of the sound evolved are of the order of thousands per second. In such case an induction coil behaves very much like a high frequency apparatus, and may be made more like it by shunting the interrupter itself with a condenser, with but a slight inductance in series therewith.

This combination is indicated in Fig. 2. where B is the interrupter, I the inductance, C the capacity (condenser), P the primary, S the secondary, at the terminals of which high frequency effects are to be produced.

At the highest rates of interruption the rates of change at make and break become more nearly alike and the induction coil secondary then emits alternating discharges.

A curious feature of these experiments should be here mentioned. When the secondary arc discharge forms, the note rises or the interruptions become more rapid. This is, of course, as it should be, since the primary current then reaches the limiting value for the interrupter in less time. When the secondary of the coil is open (terminals too far apart), a very loud noise is made in the interrupter and the vigor of its action in stopping the current indicates, so to speak, a struggle. This sound largely disappears and there is less commotion in the liquid around the platinum when the secondary coil circuit is either closed or emitting its discharges.

During action the platinum wire in the interrupter is surrounded by a pinkish-yellow glow, not over bright. Numerous bubbles, of oxygen gas, are thrown violently out from it and the effect, noise, etc., suggest the escape of steam containing a little air from a pipe immersed in a vat of cold water. The liquid and the bubbles around the platinum wire are in vigorous rhythmic movement. The following explanation is suggested tentatively:

On the attainment of a certain current density the wire becomes a veritable positive crater as in an arc, or at least the layer of electrolyte in close contact with the wire is so highly heated as to become disassociated into oxygen and hydrogen, with oxygen in excess from electrolysis. This layer insulates the wire as with a covering, stops the current, the gases reunite with explosion, casting out the excess of oxygen in bubbles, the liquid touches the wire again and the process is repeated indefinitely. This would explain why a certain current density as a limiting value must be attained at the platinum surface before the phenomenon can begin.

If the resistance in the circuit is so great that this limiting value can not be attained, the interruptions do not take place.

Curiously enough, two of these interrupting platinum anodes may be worked in parallel and the effect is that the interruptions then occur only upon the attainment of a higher current value in the circuit. Whether this value will be the sum of the limiting values for each interrupter is not determined. The running of interrupters in parallel suggests the provision of a set having values of 5, 2, 1, as in a set of weights, so that by switching in parallel or using one or the other single, any value in units from 1 to 10 might be obtained.

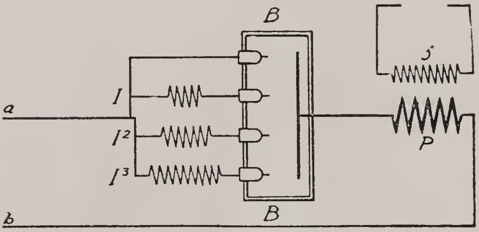

FIG. 3.—ELECTROLYTIC INTERRUPTER WITH MULTIPLE TERMINALS OF VARYING IMPEDANCE.

It is to be doubted, however, that the interruptions will be so sharp with this form as with a single interrupter. Trials made with those at hand seem to indicate this as a fact. This doubt can be settled by further experiment.

Fig. 3 shows another suggestive arrangement. Let B be an electrolytic interrupter having four platinum points immersed. One of these is connected direct to *a*; another through an inductance I; a third through inductance I^2, and the fourth through inductance I^3. Here there will be four rates of interruption of the primary P, rates which can be adjusted by taking advantage of the facts above pointed out. The secondary spark at S can thus probably be made to sing in chords, or discords, as the case may be. Here, also, as will be seen, we have the elements of a somewhat novel and striking electrical musical instrument, as we may provide many interrupters tuned to the notes of the musical scale, each interrupter controlled by a key or otherwise. How musical it can be made to be, however, is doubtful. The notes given out have a harsh, strident quality, and such waves would need considerable smoothing out to render them acceptable even to the untrained ear.

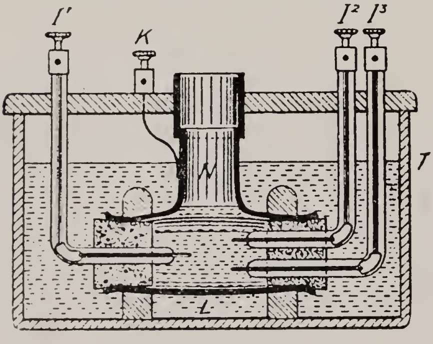

FIG. 4.—ELECTROLYTIC INTERRUPTER WITH MULTIPLE TERMINALS.

The excitation of a Roentgen ray tube by a coil worked by the Wehnelt interrupter, is, of course, a great field of usefulness. No condensers are needed and they are not even useful except for special effects, as above pointed out.

The rate of interruption may be made low or high as desired, and the apparatus is exceedingly simple and surprisingly regular. But the ordinary tubes can not survive the energy given by the interrupter. Smaller coils can, however, be used.

There is in fact great danger of melting down the platinum anticathode, and a hole may be put through it in less than two seconds' passage of current. A platinum target ⅝ inch diameter and 1-16 inch thick is made white hot in a few seconds.

Need it be said, however, that the intensity of the rays is very great? The writer's experiments convince him that the rates and energy can be so adjusted as to give a remarkably steady emission of rays resembling that obtained with a large static machine, and that the brilliance of the effects on the fluorescent screen are such as he has only seen with the selector exciter devised by Mr. Hermann Lemp some two years ago and used at the laboratory of the Thomson-Houston Co., in Lynn.

The response of the electrolytic interpreter to the closure of the circuit is so instantaneous as to be of value in certain kinds of work. Thus, in taking x-ray pictures of the chest, the closure of the circuit can be timed with the breathing movements of the chest so as to have the ribs at the same position when the rays pass; or the breathing movement itself can actually be made to open and close the switch, to the same end. In Hertzian wave telegraphy the signals can be made by a key in the interrupter circuit, the response being immediate, and when the key is left open there is no loss and no wear and tear.

This account of the personal experience of the writer with the most interesting device of Dr. Wehnelt may be closed, at least for the present, by a description of a multiple interrupter of simple construction utilizing the principle brought forward.

Referring to Fig. 4, T is a tank containing water for cooling; L is a leaden tee with neck N extending upward for escape of gases, C, C, are rubber stoppers closing the ends of the pipe L or leaden tee. Through these stoppers project a variety of platinum point interrupters whose terminals are at I^1, I^2, I^3, etc. These varying surfaces of platinum are exposed to the acid in L. The cathode is the lead L and terminal at K. This form is suggested on account of the facility it affords for cooling, an important matter when heavy currents are used. When the acid liquid gets hot or near boiling it fails to act. The interrupter necessarily consumes energy which is evidenced by the glow around the platinum and the energetic action in the liquid as well as by the noise produced. Still its working is so admirable that the waste of energy can well be supported.

Lynn, Mass., Feb. 20, 1899.—*Electrical Engineer.*

Electrolysis Induced by Roentgen Tubes.

Brodier and Salvador.—To explain the cause of Roentgen ray burns, they suppose that the same are due to the waves produced by the making and breaking of the induction-coil circuit; as the oscillations induced by the break have the greater intensity, they argue that a practically uni-directional current will be induced in neighboring electrolysis, and therefore causes electrolysis. To test this conclusion, they placed an electrolytic cell consisting of copper sulphate in the neighborhood of the Roentgen tube, with its electrodes near those of the vacuum tube. After a quarter of an hour the electrodes were connected with a galvanometer, and a deflection was obtained indicating a current in the external circuit proceeding from the copper facing the anode of the vacuum tube to the copper facing the cathode, thus confirming their conclusions. As no difference is observed when all the Roentgen rays are hindered from reaching the electrolyte, the effect is not due to them directly.—*Comptes Rendus*, June 19; abstracted in Lond. *Elec.*, July 7.

A CASE OF APHASIA DUE TO TRAUMATISM. THE MEDULLA AS A SPEECH CENTER.*

BY W. F. ROCHELLE, M. D., JACKSON, TENN.

This patient came to me for a radiograph of his head last October, and his attendant gave me the following history of his case: On October 29th, 1897, he was shot one and a half inch below the left eye with a 38-caliber pistol ball, at close range. Patient bled freely and suffered great pain, but was able to walk home. Forty-eight hours after the accident he was suddenly seized with convulsions, which were followed by right side paralysis with complete loss of speech. He made an uneventful recovery from the wound, but the aphasia and right side paralysis with continuous pains and occasional convulsions had not changed since that time. He had consulted several physicians during this time with the hope of getting relief from his sufferings. Some of these physicians' opinions had been remembered by the family and were about as varied as they were numerous, ranging from the Broca center to the occipital lobe, as the place where the ball was probably resting.

I made some tests with this patient to define more closely the variety of aphasia. Various objects, such as books of different color, pencil, pocket-knife, etc., were placed before him, and he was asked to pick up different ones at a time, which he did with no trouble or difficulty. He claimed that he had not been able to read since the accident, but the printed names of familiar objects and friends were easily recognized by him. It is difficult to decide just how much of this inability to read is due to the lesion and how much is due to the illiteracy of the patient. I attempted to have him learn to write with his left hand, but he made no progress and very little effort, apparently from want of desire to learn. He could answer any question put to him in the negative or affirmative by nodding or shaking his head. I asked him if he could understand well everything said to him, and if he knew everybody and everything by name, or if there was any trouble in his mind between the object or person and the name, and he answered me that there was not. It should be further stated that he could say the word "Joe" (his name) at any time called upon to do so, and at times, when the pain was unusually severe, he was heard to say "Lord, Lord," and "Oh, Lordy"; these are supposed to be the only words he has spoken since the paralysis, and are probably due to reflex action.

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*Read before Tennessee State Medical Society, Nashville, April 11, 1899. Clinical portion of the article is herein given.

After noting these symptoms carefully, and consulting the very valuable diagrams of Dr. Ranney on the speech centers, it occurred to me as highly probable that the ball was on the outside of the cranium, and that in the neighborhood of the medulla was the probable site. I attempted to locate it with a coil x-ray outfit; failing to do so I corresponded with Dr. Heber Robarts, of St. Louis, and made arrangements to have him make a radiograph for me, which he afterward did. As the base of the skull is very dense, and it is difficult to penetrate it at this point, the doctor had some trouble at first in getting a correct view of the ball, notwithstanding he used his ten-plate static machine. Finally he succeeded in making a perfect picture of the cervical vertebrae and base of the skull, with the bullet resting between the atlas and basilar process on the left side. It was plain now that an operation for the removal of the ball was practicable, and evidently it was indicated.

As an operation for the removal of this ball threatened to be one of very grave significance, I decided to return the patient to his family for their advice as to whether he should take the chances of his life. Shortly thereafter the family brought him to me again, willing for me to do the best I could for him, as he preferred death to his present condition of suffering. Accordingly on December 10 I cut down on the ball as per the indication of the radiograph, and succeeded in finding and removing the bullet from between the atlas and the basilar process, about the center of the left antero-lateral quadrant. As the medulla extends down to top of the atlas, the ball was opposite the lower end of the organ. Around the ball was a thickened condition of the tissues, about the consistency of cartilage, and the presumption was that this thickened tissue was making pressure on the lower portion of the medulla.

Result of operation: I saw this patient last month (March). While there was no change in the condition of aphasia, there has been only one convulsion since the operation; his ability to walk around and climb stairways with his crutch was decidedly improved, and there had been no pain.

The Rochester fluorometer was used to prove the position of the bullet.

The patient wrote to Dr. Rochelle, August 10: "I am enjoying very good health. I can't talk any but can sing a little, that is, can carry a tune of any song."—Ed.

Currents Induced by Roentgen Rays.

Winkelmann.—An article dealing with the difference of potential induced between two plates of different metals when Roentgen rays traversed the space between them. The results are in accord with the theory that the air between the plates is ionized and a constant e. m. f. exists analogous to the contact difference of potential.—*Wied. Ann.*, 56, p. 1; abstracted in *Science Abstracts*, June.

DISCUSSIONS BEFORE THE CALIFORNIA ACADEMY OF MEDICINE.

CASE OF LUPUS.

Dr. Philip Mills Jones presented a patient whom he desired to have all carefully examine, for the reason that her condition was rapidly improving, and he did not wish to continue the treatment until the case had been inspected and further progress noted by others. The patient was sent to him by Dr. Regensburger, with the diagnosis of lupus. The woman is about 48 years of age, a native of Bordeau, and has had an affection of the face for thirty-six years. It commenced when she was a child of 12, and has persistently increased in extent until the present, in spite of all effort. Very many specialists have had the patient under their charge with no benefit to the condition. Dr. Jones commenced treatment by exposure to x-rays some two months ago. The face, save the right side, which is involved from the hair line to below the lower margin of the jaw, including the entire ear, was protected by means of a heavy lead plate, perforated with a hole to correspond with the area involved. The woman was then exposed within three or four inches of a low vacuum x-ray tube for from two to eight minutes, three times a week. The length of the exposure and the frequency of the treatments was decided largely by the effect on the skin; when too much reddened by the rays, the exposures were made shorter and less frequent. A slight dermatitis developed just below the eye, and a slight conjunctivitis was also produced by the rays, a few of which managed to strike the conjunctiva at one or two seances. These troubles have now entirely passed, and indeed were but trifling in the first instance. The maximum intensity of the rays was directed toward the lower portion of the area involved, and this part of the affection is very materially better than is the ear and the upper portion. It is so rapidly improving that but little idea of the condition when the treatment was commenced can now be formed. At that time the whole area was as badly involved as the worst portion now present. The lower area is almost well, the nodules have disappeared, and the skin is regaining its soft and pliable nature.

This is the second case of lupus the doctor has treated by means of x-ray exposure. The first was entirely cured of a lesion on the forehead which had lasted, in spite of all treatment, for seven years. The patient has been away for four months, but reports no change in appearance of former lesion.

Dr. D. W. Montgomery.—This seems to be a clear case of lupus. The history, the nodules and the general clinical picture all go to confirm the diagnosis of lupus. There is, however, a great difference between lupus and skin tuberculosis; clinically, if not etiologically, and whether both diseases are caused by the tubercle bacillus is still an open question. The tubercle bacillus is, however, found in both lesions, and if they will both yield to x-ray exposure it leads one to question whether the exposure to these rays would not be of benefit in tubercular lesions of other sorts. Lupus is found to commence before the 16th year, but tuberculosis of the skin may commence at any age. The question of the two diseases being the same affection is disputed by many good observers, but claimed by others. I am strongly inclined to believe that they are not the same affection, clinically, even if they prove to be etiologically. Lupus, true lupus, is a very rare disease in this country, and particularly so in California. I do not remember to have ever seen a case of true lupus occurring in a native; but tuberculosis of the skin is fairly common.

Dr. P. M. Jones.—According to the

differentiation made by Dr. Montgomery, the first case I treated in this way was not true lupus, but was rather tubercular lesion of the skin, for it occurred in a man of about 50 years. It was, however, entirely healed by the x-ray exposure, and to date has remained healed. In regard to what Dr. Montgomery has said of tuberculosis in other regions. I have exposed three cases of clear tubercular lesion of the lungs, in all of which patients the bacilli could be found in goodly numbers in the sputum. The patients all improved, the bacilli disappeared from the sputum, the night temperatures ceased, and now the patients say that they "feel perfectly well." I do not say that the patients were cured by the x-ray exposure, for it may have been spontaneous cure in all of them, but they certainly are now well, and also just as certainly had tuberculosis of the lungs at the time treatment was commenced.

A Roentgen Ray Lamp.

A patent was issued May 23 to Andrew Plecher, of Savannah, Ga., for an apparatus for Roentgen ray illumination. An electromagnet is sealed tightly within the walls of a vacuum bulb. The winding of this electromagnet is connected to a source of high-frequency current. About the primary wire is wrapped a secondary wire in the shape of a coil all along the length of the primary as it extends from one lamp to the next, which thus forms a sort of elongated induction coil between the two coils. The cathode rays radiate from the terminals of the secondary wire, are deflected by the influence of the magnet within the bulb and bombard the specially prepared surface of the magnet core. The inner end of the magnet core bears a convex plate which is covered with a substance which flashes or shines from the bombardments of the cathode ray. The substance used is known on the market as "christaux de Sidot," made by L. M. Unkel, at Brunsweig, Germany. It is stated that the bombardment of the end of the core causes the lamp to give forth an intense illumination.—*Electrical World and Engineer*, N. Y.

Cardiac Arrhythmia Observed by the Roentgen Rays.

Aug. Hoffman (*Duet. med. Woch.*, April 13, 1899) says that the movements of the heart as observed with the aid of the Roentgen rays have received little attention. They can mostly be readily seen, especially in the lower third of the left border of the heart. The observation of irregular cardiac action is specially interesting, as it is possible to see how the different cardiac contractions take place. The author says that he has had on several occasions the opportunity of seeing the arrhythmia in the well-marked Roentgen picture. The most frequent forms of cardiac irregularity are the pulsus bigeminus and the pulsus alternans. It may be difficult to recognize the kind of arrhythmia present if the alternate and unequal beats do not reach the radial artery. Sometimes the cardiac impulse can not be seen or felt, and even auscultation may not reveal the very diminished alternate contractions. The author relates an illustrative case in a man aged 26. Here the apex beat could not be seen or felt. The pulse was 78. Fourteen days later the pulse was 40. Even with the phonendoscope, the beat, which could not be felt at the wrist, was only represented by a very feeble sound. By means of the Roentgen rays this very weak contraction was readily recognized, as the movements of the left lower border of the heart could be easily seen. A sphygmographic tracing of the pulse gave no indication of the dropped beat. Thus the case might have been looked upon as one of bradycardia. A few days later the pulse was 80 again.

TRANSLATIONS.

BY FRANK RING, M. D.

[Continued from August issue.]

Roentgen Rays Applied to the Study of Medico-Chirurgical Affections and Especially Tumors. (*Cetre These de Doct.*, Lyon.)

A Double Fracture of the Forearm. An x-ray case. (Chendlee, in *Ann. M. Monthly*, Balt.)

Report Upon the Application of the X-Rays to the Diagnosis of Pulmonary Tuberculosis. (H. Claude, in *Arch de Electric. Med.*, Bordeau.)

Comparative Study of Divers Proceedings Employed for the Determination of Foreign Bodies. (Cluzet, in *Arch Elect. Med.*, Bordeau.)

Study of Combustible Materials by the X-Rays. (Demenge, in *Rev. Gen. d. Sci. pures et App.*, Paris.)

The cases of Foreign Bodies in the Throat, in which the position of the body was determined by the x-rays. (W. Downie, in *Med. Press. et Arc.*, London.)

A. Rare Injury to the Wrist Diagnosticated by Diagraphy. (Dumstrey, in *Fortschr a. d. Gab. d. Roentgenstrahle Hartz.*)

Diagnostic Value of the X-Rays. (J. T. Dunn, in *Internat. J. Sing*, N. Y.)

Application of Radiography to the Study of Coxalgia. (Gardette. *These de Doct. Lyon.*)

Roentgen Rays Applied to Determine the Presence of Foreign Bodies in the Eye. (Ginsburg, in *Vestrik. Aftalmol Kier.*)

Textbook of X-Rays Investigations for the Use of Physicians. (*Gocht. Stuttg. F. Enke.*)

Apparatus Promoting Radiography of the Thorax, Whether in Inspiration or Expiration. (Guillemenot, in *La Voix*, Paris.)

Radiographic Researches Upon the Topography of the Internal Ear. (Gulloz et Jacques, in *Rev Hebd. d. Laryng. Obol*, Bordeaux.)

X-Rays Skebel in Askomyelites With Segnestrum. (Hahn, in *Muenchen Med. Wehnschr.*)

Further Communication Upon the Value of X-Rays in Medicine. (Jankau, in *Internat. Phot. Moenchschr Juer. Med. Muenchen.*)

Cure of Hypertrichosis With Roentgen Light. (Jetassy, in *Ungen Med. Presse*, Budapeth.)

X-Rays, Their Production and Application. (Kolle, N. Y., J. S. Ogelvie Pub. Co.)

Recognition of an Osteo-Sarcoma of the Lung by X-Rays. (Leo, in *Deutch Med. Woch*, Leipsig.)

Therapeutic Effect of the Roentgen Ray.

Dr. Southgate Lee has reported a few cases which bear on this subject. The first was that of a young man with a bullet in the thigh. At the time of the examination the knee was very much swollen, exquisitely tender and painful. The slightest touch or motion made him cry out in agony. The doctor, having at that time an imperfect coil and poor tube, exposed the knee to the x-rays for four hours in order to get a photograph. The next day the patient moved about the bed without pain, the second day he was up in a chair, and the third day he was walking around on crutches.

The second case was one of tuberculosis of the elbow joint. Prof. Wyeth had advised excision. Nicola Tesla, when consulted, advised a trial of the x-ray. Accordingly the joint was exposed to the ray two or three times a week for two hours each time, until the total exposure was about twelve hours. After each exposure a wet dressing was applied. In a short time all signs of inflammation had disappeared, and now eighteen months have passed without any return of the disease.—*Health*, London, Eng.

The Determination of the Size, Shape and Position of the Stomach by Means of the X-Rays.

Rosenfeld (*Centralblatt fur innere Medicin*, 1899, *Vratch*, Vol. XX., No. 15) employs the following method: Into the stomach is introduced a soft sound, 11 mm. in diameter and 120 cm. long, closed at one end and filled with small shot, so that the entire weight of the tube does not exceed 150 gms. 10 cm. of the lower blind end is perforated by means of a red hot needle with small holes directed at an angle which would admit of air, but not allow the shot to pass through. The sound is introduced until it reaches the most dependent portion of the stomach. Then its location is found by the X-rays, and its shape modeled on a lead rod, which is held in front of the sound, so that the shades of both the rod and the sound correspond. The rod is then used for drawing a line on the skin corresponding to the position of the sound. The stomach is filled with air by means of a rubber bulb attached to the outer end of the sound and observed by means of the x-rays. It will appear as a bag distended with air, and its outlines can be made out distinctly, and drawn on transparent paper.

X-Ray Examinations in Children.

Williams emphasizes the usefulness of the x-ray examinations in children. They are more easily penetrated by the rays and caution should be taken to avoid too much light on this account. In some cases of pneumonia, especially in the early stages, the x-ray may be of decided value in the diagnosis, also in cases where the symptoms suggest tubercular meningitis, and in pleurisy with effusion or empyema. The size and position of the liver and spleen are more readily determined than with adults, as is also the case of the kidneys, especially the left one. By giving subnitrate of bismuth with bread and milk, changes in the size and shape of the stomach after a meal may be followed. Investigations on these points have been made in conjunction with Mr. W. B. Cannon, which are yet to be published. There need be no fear of untoward effects if proper precautions are used. Williams has had none in about 3,000 examinations.—*The Journal of the Am. Med. Ass.*

Capacity of Poor Conductors.

Borgmann and Petrovski.—An Academy paper on researches in which they measured the electric capacity of certain liquids and gas conductors. They found that the capacity of columns of good conducting liquids, is approximately equal to that of equal columns of mercury; this is true for poorly conducting liquids only for columns of small heights; if the height increases the increase of capacity is less in proportion. Columns of insulating liquids have no capacity. The capacity of a tube filled with a rarefied gas, increases as the pressure decreases, to a certain limit; a Crookes' tube has only a very small capacity, equal to that of the electrode. The illuminated part of long tubes increases with an increasing capacity, that is, with a decreasing pressure. The capacity of Geissler tubes in series is less than the sum of their individual capacities. If one end of a Geissler tube placed parallel to another, is connected to earth, both tubes are illuminated.—*L'Ind. Elec.*, June 25.

Cases Subjected to Roentgen Radiation.

Zeleny.--Passage of electricity through a gas under the influence of Roentgen rays is accompanied by movements of the gas itself, which are of considerable magnitude and can be made visible by ammonia-chloride fumes. The gas is dragged by the moving ions; equally in both directions if there is no free charge, and more in one direction than the other if there is a free charge.—*Cambridge Phil. Soc. Proc.*, 10, p. 14; abstracted in *Science Abstracts*, June.

Chronic Tuberculous Peritonitis Cured By the X-Rays.

Ausset and Bedart (*L'Echo Med. du Nord.*, No. 46, 1898) had treated a case of unquestioned tuberculous peritonitis in a girl of nine years, by tapping, abdominal section, renewed tapping, and washing out with a creosote solution, with no good result. In fact, during this treatment her condition grew steadily worse, and the tuberculous masses in the abdomen steadily enlarged. March 7th, she was first subjected to the x-rays, the Crookes' tube being placed 20 cm. from the surface of the abdomen for ten minutes, two days later at 13 cm. Throughout the month the treatment was continued every 2 or 3 days. During most of April the treatment was unavoidably discontinued, to be resumed toward the end. By the last of May there was absolutely no abdominal effusion. From this on she steadily improved, gaining weight and strength, until she became apparently well. The x-ray produced no dermatitis, merely a decided pigmentation of the exposed region, which could still be seen 90 days after cessation of treatment.

Roentgen Rays in Cutaneous Affections.

Deutsche Medicinische Wochenschrift, Berlin, March 23.—Albers presented at the meeting of the Hamburg Medical Association, November 29, a number of patients with lupus, chronic eczema, favus and psoriasis, cured or in various stages of treatment with the rays, one case of lupus cured for a year, and another in which an incipient recurrence was promptly aborted. The first effect noted in lupus is a diffuse redness and heat in the part, usually after five to six exposures, followed by increasing prominence of the nodules, falling of the scabs and cleaning up of the ulcerations, while the much swollen regions, nose, lips, etc., gradually subside to normal. The epidermis is gradually cast off, leaving after weeks of treatment a smooth, delicate skin, very sensitive, but absolutely free from lupus. Chronic eczema requires only ten or twelve exposures at most. In one case of chronic impetiginous eczema of the head in a child of eleven months, the hair returned normally in a few months after the cure of the eczema.

Stereoptican Pictures By the X-Rays.

Mr. Mackenzie Davidson's stereoscopic apparatus for Roentgen screen images marks a further considerable advance in the field where he has already done so much good work. His previous apparatus for localising foreign bodies have aimed at determing the coordinates of the body by means of photographs, and this had obviously the disadvantage that careful measurement and setting out of the results were necessary before the exact position of the foreign body could be indicated to the surgeon. For military field surgery there is the further objection to the photographic method, that it involves the transport of considerable quantities of photographic material. Mr. Davidson in his new apparatus seeks to dispense altogether with photography, and to make use of the screen images only. He makes use of a principle which has already been used in the production of stereoscopic images by the magic lantern. By means of two x-ray lamps instantaneous images, stereoscopically related, are thrown in rapid succession on a phosphorescent screen. These images are looked at through a rotating disc shutter, so arranged that one eye sees only one series of images, and the other eye the other series of images. On the axis of the shutter disc are two eccentrics set at an angle of 80 , which actuate the mercury contact breakers of the two induction coils which excite the two x-ray lamps. The whole arrangement is driven by an electromotor on the axis of the disc. The speed must be sufficient to ensure continuous images. The images seen by this apparatus appear solid, and foreign bodies are seen in their true position. If this apparatus can be applied directly in surgery, the improvement on the older methods is obvious—*Electrical Review*, London.

Units, Measurements and Instruments.

Wehnelt Interrupter.—Humphreys.—A long description of extended researches to study the action and properties of this interrupter. Some of the observations have already been made by others and are therefore omitted here. He used the currents from a battery giving 75 volts. For negative electrodes, lead, copper, amalgamated copper, and coils of wire were used, with equal success; the positive electrode was the end of a platinum wire sealed in a glass tube as usual; this platinum becomes pitted due to an arc discharge. The better the conductivity of an electrolyte, the better are the results; dilute sulphuric acid seems to be best for general use. The glow around the anode when examined with a revolving mirror, was found to be intermittent and its spectrum showed hydrogen and oxygen, proving that the light is due to an electric discharge through these gases or compounds of them. The action was greatly disturbed by a strong magnetic field whose lines were at right angles to the current. A change in the hydrostatic pressure alters the pitch of the anode and the character of the spark; an increase in pressure lowers the frequency and produces larger sparks. The kind and quantity of the gases at the positive pole differs from those due to ordinary electrolysis; the negative pole gives off only hydrogen when running at its best; the volume of gas from the positive pole is nearly equal to that from the negative. With a low voltage the interrupter starts at once, independently of where the circuit is closed, but with higher voltages the electrode must be inserted in the acid first before the circuit is closed. With a small electrode the current rises with the voltage to a maximum and then decreases again; with a surface of 4 or 5 sq. mm.; the maximum current was obtained with 50 volts. There are three stable conditions of the positive electrode which change abruptly from one to the other. The breaking becomes steadier with a lowering of the external resistance. With a small self-induction a break can be obtained only with correspondingly small anodes. A decrease in the self-induction increases the average current, which is contrary to what was observed by Pellat. In a shunt to the break there will be a larger current when the break is in operation than when its circuit is open. A frequency of about 300 per second was found to be the best with an ordinary coil for a large x-ray tube. With electrodes of suitable size the action is most satisfactory for both fluoroscopic and radiographic work. He concludes with an explanation of the action of the break.—*Phys. Rev.*, July.

Radiations.

Abbott.—A brief abstract of a paper from the *Jour. West. Soc., of Eng.* The historical description is said to be especially good. Among other things, he stated that in order to bring the wave length of the Hertzian waves down to that of light it will be necessary to have spheres of the size of the ultimate atom, the charges and discharges taking place between such spheres. A table is given in the original (but not in the abstract) for the wave lengths of different waves. That of the magnetic waves from the sun is given as 1.25 million miles, a complete vibration extends over 6.5 seconds. The wave length of a flash of lightning is given as 11,000 miles and 17 vibrations per second. That from a discharge of a pint Leyden jaris 34 ft., while a large oscillator produces a wave one foot long. The shortest electrical waves so far produced is said to be 2.5 inches, and if the wave length of red light is roughly three-millionths of an inch, there is a great gap between these two. The efficiency in wireless telegraphy is approximately one 500,000,-oooths of 1 per cent. (this of course depends on the distance).—Lond. *Elec. Eng.*

Electro-Physics and Magnetism.

Secondary Roentgen Rays.—Malagoli and Bonacini.—In determining what becomes of x-rays after they have impinged on a body, the authors divide all bodies into three classes, first those which simply diffuse the rays, those which transform them into other rays having different properties, and finally those which do both. This is analogous to a white body, a black body and a colored body. According to Sagnac there are no bodies corresponding to the white bodies in the case of light, but the present authors point out that Sagnac's transformation is often simply a diffusion and there is no reason to assume the existence of "Sagnac rays;" they conclude that x-rays can be diffusively reflected as such.—*Nuovo Cimento*, April; abstracted briefly in Lond. *Elec.*, June 9.

Pressure and X-Ray Ionisation.

Hillers.—An account of experiments made to investigate the manner in which the pressure of the gas between two plates affects the current which passes when they are brought to different potentials, and x-rays are allowed to traverse the gas. He finds that the moisture of the gas does not affect either the potential or the current intensity, and gives a formula for the potential as a function of the pressure; the potential increases with the pressure. The conductivities of air, carbonic acid gas and hydrogen are in the ratio of 1:1.18:0.50, but the potential in the case of hydrogen is probably affected by an occlusion of hydrogen in the metallic plates. The ratio of the numbers of ions dissociated in unit volume under unit pressure when under the influence of the same Roentgen radiation is 0.29:1 for hydrogen and air. For carbonic acid gas the dissociation is very nearly the same as that of air.—*Wied. Ann.*, No. 6; abstracted in Lond. *Elec.*, July 14.

The Inflammatory Condition in Peritonitis, Etc.

An interesting reference to an extensively prescribed remedy is found in that valuable text book "Materia Medica and Therapeutics" by Finley Ellingwood, A. M., M. D., Chicago. The substance of the article is to the effect, that the influence as a pain reliever of the popular analgesic—Antikamnia—is certainly next to morphine, and no untoward results have obtained from its use, even when given in repeated doses of ten grains (two five-grain tablets). It is especially valuable during the progress of inflammation, and given in pleuritis or peritonitis it certainly abates the inflammatory condition, relieves the pain at once and the diffused soreness shortly, as satisfactorily as opium. It does not derange the stomach or lock up the secretions. It is also of value in pain of a non-inflammatory character, and is a convenient and satisfactory remedy in headaches without regard to cause, if the cerebral circulation be full.

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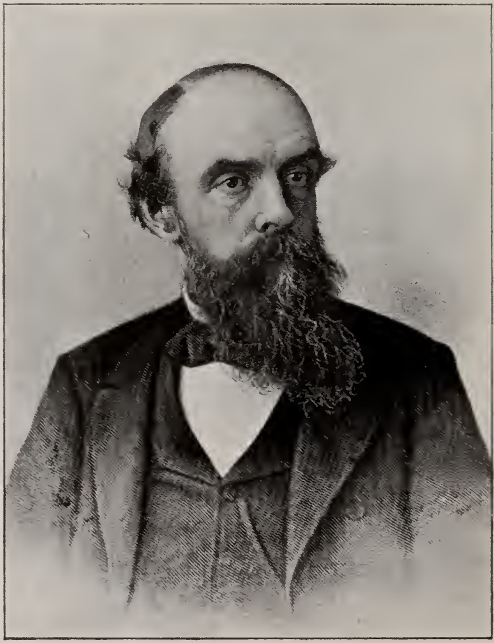

R. J. NUNN, M. D.

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EXCITATION OF THE CROOKES' TUBE BY THE STATIC MACHINE.

BY JOHN T. PITKIN, M. D., BUFFALO, N. Y.

Since the discovery of the utility of the Roentgen ray in the practice of medicine for diagnostic purposes, static machines of many kinds and descriptions have been brought forward as generators of the lightning current employed to excite the Crookes' tube for their production.

Having employed considerable time and means to determine the relative merits of these instruments, let me rapidly pass in review the results of our investigations.

A cheap machine is dear at any price, poor in construction and meager in output, it endangers the patient's body to electrical burns which may even jeopardize his life.

The Toeplar Static Electrical Machine is the easiest to excite and maintain in a state of charge but as this type of instrument often reverses its polarity while in operation it can not be recommended for x-ray work.

Machines containing rubber plates rapidly deteriorate their generating power, becoming less and less by warping and oxidizing of the rubber disks.

The plain Holtz machine, on the other hand, if of adequate size and construction, when properly operated, stands preeminently adapted for the purposes of the expert Roentgenian.

This type of machine, although it requires another instrument to excite its plates into primary action, does not reverse while working, is easily operated by one versed in its requirements and does not necessitate as thorough a knowledge of electricity as does the successful operation of the high tension coil apparatus.

Each pair of revolving plates and their immediate accessories in a Holtz machine may be considered as a separate instrument generating its individual bands or lines of force and that in the complex machine these units or pairs of plates, etc., are connected with each other in multiple harmonic relation.

In the construction of the Holtz machine for x-ray work, the number and size of the revolving glass disks is of prime importance, because the quantity and pressure of the currents are thereby determined. A two-plate machine of a given size will therefore discharge an electrical stream just as far through the atmosphere as an instrument having many times that number, but the amount of current will be very small.

In proof of the foregoing statement let me state that we have in our institution machinery capable of demonstrating this fact, instruments large and small, good, bad and indifferent.

As we look backwards some three or four years, we recall that the best instruments supplied to us by the standard makers at that time, contained but eight 28-inch revolving plates, giving, under the greatest practical momentum, a ten to twelve-inch spark with about four fibers of force playing between the discharging rods. The estimated voltage from these machines was from one to two millions, but the amperage was very low. Under the most favorable condition of the atmosphere and momentum, the x-rays from such a source may be considered fair, but are unsatisfactory to the expert operator.

About two years ago the manager of the Buffalo Electrical Sanitarium induced one of the standard makers to construct a machine having ten revolving 30-inch disks (the first ever constructed) with the most satisfactory results, because both voltage and amperage of the current were thereby increased and the x-radiation obtained therefrom considerably augmented, for the increase in the size of the revolving plates of a given thickness and quality of glass intensifies the voltage or pressure, while the addition of new plates increases the amperage or quantity of the current.

As a result of this improvement in the capacity of the static machine, over one hundred have been built on our specifications and are now in successful operation throughout the country. But the zenith of perfection of the static machine as a Crookes' tube exciter we are satisfied has not as yet been attained.

Shall we now in order to better the standard machine, increase the number, the size, or both the size and number of the revolvers? If the former plan is pursued the voltage will exceed two millions, will be correspondingly hard to control by insulation and will completely short-circuit through the woodwork of the apparatus, even through the air. The danger zone around the tube will be increased in area. With a hard tube in circuit the current will jump from one conductor to conductor of opposite polarity inside of the apparatus or around the tube on the outside. Its severe impact will often puncture the tube just as it has been worked up to a condition of greatest usefulness. To avoid these untoward results, the wheels should not exceed 28 to 30 inches in diameter or else they should be driven at a very moderate rate of speed. Let us rather increase the number of plates, adding two more, making a twelve-plate apparatus.

Having operated the ten-plate machine previously mentioned over two years, we have replaced the same by a new instrument (the first to be built) containing twelve 30-inch revolving wheels. This apparatus has been otherwise modeled to suit all of our whims and fancies. This machine in operation, when driven at a moderate speed, produces a ten to fifteen-inch spark, which is very fat, i. e., has six electrical bands playing between the discharging rods. (All x-ray apparatus giving a long thin spark will prove to be a failure, a delusion and a snare.) In performing x-ray work the new apparatus causes a Crookes' tube as large as a cocoanut to light up at once and maintain a steady, uniform light without flickering or bebecoming dark, and the x-ray bulbs should last for years under the relatively moderate electrical pressure.

Skiagraphs can be taken through the adult's body at the safe distance of one to two feet, in from one to five minutes. Although we do not consider this machine *ne plus ultra*, having at this early date other specifications in the hands of the makers, still we do consider that it is one more step forward toward x-ray perfection.

ON THE LUMINOSITY OF THE RARE EARTHS WHEN HEATED "IN VACUO" BY MEANS OF CATHODE RAYS.*

BY A. A. CAMPBELL SWINTON.
Communicated by Lord Kelvin, F.R.S.

For incandescent gas mantles it is found that certain definite mixtures of the rare earths are necessary in order to obtain the maximum luminosity. For instance, in the ordinary Bunsen gas flame, a mantle consisting of pure thorium oxide, or of pure cerium oxide, will only give about $\frac{1}{11}$th of the light that is given by a mantle composed of 99 per cent of thorium oxide and 1 per cent of cerium oxide, which is the mixture at present used by the Welsbach Company.

In order to explain this remarkable fact, several different and somewhat contradictory theories have been propunded, one of which implies catalytic or other chemical action between the oxides and the constituents of the Bunsen flame.

In order to investigate this question, it is obviously important to note the behavior of the rare earths at high temperatures without contact with any flame, and endeavors have already been made to effect this by heating the oxides in specially constructed furnaces. Under these conditions, only very minute differences could be detected in the amount of light given by different oxides and mixtures, but it appears doubtful whether the very high temperature of the Bunsen flame was really attained.

It has occurred to the writer, that very high incandescence could be produced by enclosing mantles in a vacuum tube, and subjecting them to bombardment by means of cathode rays, when the mantles would not be in contact with anything except the cathode rays themselves, and the comparatively small amount of residual gas that remains in the tube at the requisite high degree of exhaustion.

Since the date of Sir William Crookes' early researches, it has been known that a very high temperature could be produced in a body placed at the focus of the convergent rays from a concave cathode. In this manner Crookes melted platinum and glass, and brought carbon wool to bright incandescence. The writer has made many experiments on this subject, using instead of the interrupted continuous currents employed by previous investigators alternating electric currents, which appear to have many advantages for this purpose. At the Royal Institution, in February, 1898, the writer showed that very brilliant incandescence could be obtained for a short time in a small block of lime, placed in a suitably exhausted tube midway between two concave electrodes, connected to an alternating electric supply to about 6,000 volts pressure, and in June, 1898, at the Royal Society, he exhibited in action a similar arrangement, but with the block of lime replaced by a flat plate of orium oxide. In this case the concave electrodes were of such a curvature and were placed so far apart, that the two sides of the thorium plate in each case intersected the diverging cone of cathode rays. Under these conditions nearly a square inch of the thoria surface of each side of the plate became highly incandescent, and a very powerful light was obtained for some minutes at a time, but only at a critical and highly unstable degree of vacuum.

The writer has now applied this method to the investigation of the comparative luminosity of different mixtures of the rare earths.

One form of the tube employed was constructed as shown in fig. 1, where c, c' are two spherically concave discs of aluminum 1·125 inches diameter and 6 inches radius of curvature. These electrodes are placed about 7 inches apart, and were connected to the secondary terminals of a 10-inch Ruhmkorff coil, the primary of which was supplied through a variable resistance, with alternating electric current at 100 volts pressure from the main. The tube was connected through a drying tube containing phosphorus pentoxide to a pair of Toepler pumps, and also to a McLeod gauge.

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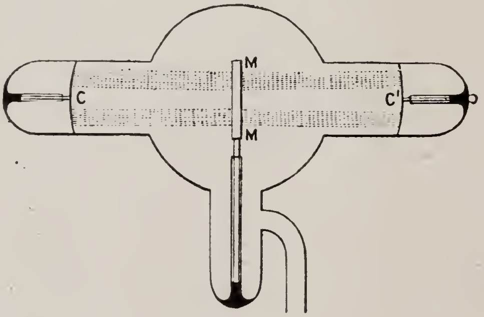
*Royal Society. Read April 27, 1899.

The mantle, M M, to be experimented upon was mounted on a platinum wire frame, and placed between the two electrodes, so that as the electric current alternated, and each electrode became in turn cathode, the mantle was subjected on alternate sides to cathode ray bombardment. The curvature of the electrodes was such as to give almost parallel beams of cathode rays, so that a considerable ring shaped and slightly hollow area on each side of the mantle was subjected to the rays, and could be brought to high incandescence.



A preliminary experiment was made with a mantle of asbestos, powdered over in patches with pure thorium oxide. With this it was found that at a suitable degree of exhaustion, the patches of thoria became brilliantly incandescent, with an intensity of cathode rays that made the asbestos barely red hot.

Experiments were next made with mantles consisting entirely of thoria and ceria, both separately, and mixed in different proportions. These mantles were prepared in a similar manner to the Welsbach incandescent gas mantles, by saturating a carefully purified cotton fabric with ammonium nitrate of thorium and cerium, and then burning out the cotton. Very thick and closely woven cotton lamp wick, freed from foreign matter by treatment with caustic soda, hydrochloric acid, and ammonia, was employed in place of the thin fabric usually used, so that the resulting mantle, after burning out the cotton, was very close in texture, and fully 0·2 inch thick. This was found necessary, as otherwise some of the cathode rays passed through the mantle and melted the opposite aluminum electrode.

In order to obtain accurate comparisons between pure oxides and different mixtures, the mantles were made in patchwork, each complete mantle being made up of two or four sections, separately impregnated with different solutions, and then sewn together with impregnated cotton before being burnt.

The mantles were so mounted in the vacuum tube that the cathode rays impinged equally upon the portions that consisted of different mixtures, so that an equal amount of energy was imparted to each sample.

With a compound mantle prepared in this way, composed one-half of pure thorium oxide, and the other half of a mixture of 99 per cent thorium oxide plus 1 per cent of cerium oxide, it was found after exhaustion that on starting the cathode discharge the thoria plus ceria heated up to incandescence more rapidly, and on stopping the discharge, cooled more rapidly than the pure thoria. Further, when at full incandescence, and observed through a dark glass, the thoria plus ceria was slightly more luminous than the pure thoria, though the difference was very small—probably not more than 5 per cent. Owing to the difficulty of obtaining a constant vacuum, accurate photo-metrical measurements were not possible, but the amount of light under favorable conditions was roughly estimated at, at least, 150 candle-power per square inch of incandescent surface, this being obtained with an expenditure of electrical energy in the secondary circuit at about 8,000 volts pressure of approximately 1 watt per candle. The amount of exhaustion suited to give the best results varied with the dimensions of the tube and the conditions mentioned below, but was approximately about 0·00005 atmosphere, the maximum luminosity being obtained when the dark spaces of the two cathodes just crossed at the center of the bulb. Owing to the large amount of gas occluded by the mantle, a proper degree of permanent exhaustion was very difficult to arrive at, and required continuous pumping for many hours with the cathode rays turned on at intervals. Even then the condition of maximum luminosity were exceedingly unstable, owing to the further liberation of occluded gas on the one hand, and on the other to the rapid increase in the degree of exhaustion owing to absorption of the residual gas by the electrodes. That such absorption probably took place in the aluminum electrodes, and not in the mantle, was demonstrated by other experiments with a tube in which there was no mantle, but only two electrodes of aluminum wire.

After the cathode rays had been allowed to bombard the mantle for a short time, the latter was found to have become discolored where bombarded. That portion which was composed of pure thoria became dark blue, while the thoria plus ceria became brown. This effect, which appears to be analogous to those observed by Goldstein with lithium chloride and sodium chloride,* seems to be due to a partial reduction of the oxides by the cathode rays. The admission of a very minute quantity of air to the tube while the cathode rays are acting on the mantle, and the latter is in parts incandescent, causes the discoloration to disappear instantaneously on the incandescent, but not upon the cool portions, probably by re-oxidation of the partially reduced oxides, while the discoloration also slowly vanishes in a day or two with the mantle cold if air at ordinary atmospheric pressure is admitted to the tube. By continuing to bombard the mantle with cathode rays, and alternately allowing the vacuum to increase and letting in small quantities of air, the discoloration can be made to appear and disappear over and over again as often as desired. At the moment of admitting the air, the amount of light was found momentarily to increase, this being probably due to the increased temperature due to the reoxidation of the partially reduced oxides.

After repeating this process of letting in small quantities of air, and allowing them to be absorbed several times, it was found that the degree of exhaustion which gave the maximum incandescence had altered from 0 000047 to 0 000112 atmosphere, as measured by the McLeod gauge. Similar effects were obtained with a tube containing no mantle, but only aluminium wire electrodes, the inference being that some change takes place in the residual gas which renders it less conducting.

At a higher degree of exhaustion than that which produced incandescence of the mantle, the pure thoria was found to fluoresce blue, and the thoria plus ceria with a yellowish light. The fluorescence in each case was much less bright when the oxides were white than when they had become discolored by previous bombardment. With very high exhaustions the thoria plus ceria fluoresced the more brightly; at lower exhaustions the pure thoria gave the brighter fluorescence.

On the suggestion of Mr. W. Mackean, the tube was pumped up to a very high vacuum and oxygen admitted. A similar experiment was made with hydrogen, the tube being completely filled with the gas, and then pumped to the proper degree of exhaustion. Though at low exhaustions these gases gave distinctive appearances to the discharge in the tube, no difference in the behavior of the mantles with them and with air could be detected when once the vacuum reached the degree required for producing incandescence of the mantle.

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*Wied Ann., 1895, No. 54, p. 371.

Further experiments were made with a similar tube containing a compound mantle made up of four sections, composed as follows: (1) pure ceria, (2) pure thoria, (3) 50 per cent thoria, 50 per cent ceria, (4) 99 per cent thoria, 1 per cent ceria.

With an intensity of cathode rays that gave a brilliant light with Nos. 2 and 4, Nos. 1 and 3 were found to give practically no light, becoming barely red hot; while, as before, No. 4 was found to give slightly more light than No. 2, and to heat more rapidly and to cool more rapidly than the latter.

These experiments show that thoria and ceria, both alone and mixed behave quite differently when heated by cathode ray bombardment than when heated in a Bunsen flame. In the latter 99 per cent thoria, plus 1 per cent ceria, gives many times as much light as pure thoria alone, while when incandesced by cathode rays of equal intensity the difference, though in a similar direction, is exceedingly small. Again, in the flame pure ceria gives just about the same amount of light as pure thoria, while with a given intensity of cathode ray bombardment, thoria gives a brilliant light while ceria gives practically none.

In arriving at any finally satisfactory theory of the luminescent properties of the rare earths, these results with cathode rays, which differ materially from those obtained by other methods of heating, will require to be taken into account.

I am indebted to the courtesy of the Welsbach Incandescent Gas Light Company for the sample of the rare earths with which the above investigations were made; also to the assistance of Mr. J. C. M. Stanton and Mr. H. Tyson Wolff in carrying out the experiments.—*Electrical Review*, London.

Diffraction of Roentgen Rays.

Maier.—An account of a series of experiments made to determine the wave length of Roentgen rays by means of diffraction. In the course of an investigation made for the same purpose, Fomm had used a linear source of Roentgen rays, a slit parallel to it, and a screen behind the slit, on which he detected two systems of fringes, one on each side of the slit, and one system in the image itself In trying to repeat this experiment Maier used every variety of focus tube and altered the elements of the arrangement in every conceivable manner, but without success; but when he used ordinary Crookes or Hittorf tubes, he obtained the fringes sought, or rather the first minimum within the image. From his measurements he calculated the wave length to be about a thirtieth of the wave length of ordinary light, which is good agreement with Fomm's figures.—*Wied. Ann.*, No. 8; abstracted in Lond. *Elec.*, Aug. 25. *Elect. W. and Eng.*, N. Y.

Instantaneous Radiographs.

Caldwell.—A short illustrated article on experiments performed to obtain good radiographs with very short exposures, varying from a single discharge to one second. He did not employ any new or unusual methods, but used very efficient tubes and exciting apparatus and developed the negative with care. The exciting apparatus consisted of a good oil-insulated induction coil, capable of delivering a 12 or 14-inch spark, and a Caldwell interrupter giving about 34 breaks per second. The negatives were made on celluloid films, which laid face down upon a tungstate calcium screen.—*Elec. Rev*, July 26.

Foreign Bodies in the Eyeball Located by X-Rays.

Dr. Hansell, at a recent meeting of the Section on Ophthalmology, College of Physicians, Philadelphia, detailed the case of a young man shot through the right eye. The x-rays located the shot in the orbit slightly posterior to the globe. Under expectant treatment the inflammation subsided, and the eye remained quiescent for several weeks. Then symptoms of sympathetic irritation developed, and the injured ball was enucleated. Upon examination the shot was found lodged in the optic nerve. This case seems to substantiate the claims made recently that sympathetic ophthalmia may arise from injury directly to the nerve, and be conveyed by means of the lymph channels of the optic nerve to the tract, and thence to the sound eye. But it must be remembered that in most cases, as in this one, the anterior structures have been seriously damagad, and the origin of the sympathetic involvement may well be the ciliary region, universally admitted to be the "danger zone."

Dr. Harlan reported a case of "Splinter of Iron in the Eyeball," with iritis and hypopion, located by the x-rays and removed with the electromagnet. A machinist was struck in the right eye by a chip of iron from a cold chisel nine days before he presented himself at Wills' Eye Hospital. Although suffering considerable pain and loss of vison, he had simply bound up the eye and continued his work. He had a small scar near the temporal border of the cornea, in the equator of the ball, iritis with posterior synechia and hypopion, and haziness of the lens preventing a view of the fundus. In the middle of the outer half of the iris, behind the corneal scar, a small bead of lymph seemed to hide a penetrating wound, and streaks of opacity, extending from the temporal to the nasal side of the lens, suggested that a spiculum of iron had passed through it and lodged in the fundus. Dr. Leonard, of the University laboratory, reported that a long, narrow splinter of iron was lodged just behind the iris, transfixing the margin of the lens. An incision five or six mm. long was made through the cicatrix in the cornea, and the large, blunt electrode of a Hirschberg magnet was applied against it externally, when an iron splinter ten mm. long and one mm. wide was promptly extracted. Ice was applied for a few days, and the patient left the hospital with the eye nearly quiet and no other disability than a cataractous lens. Attention was called to the fact that the lens and vitreous afford the most favorable field for the removal of foreign bodies by the magnet after the lapse of considerable time, as they do not become involved in dense cicatricial tissue, as when lodged in the choroid. The skiagraph was shown of another case in which a chip of iron was found after enucleation, imbedded in the choroid near the optic disk, where it had been for three weeks. It was so firmly encased in scar tissue that the magnet had no effect when applied directly, and quite a tedious dissection with scissors points was necessary to release it. It is not probable that it could have been dislodged even by a Haab magnet.

Dr. de Schweinitz read the notes of a case of "Foreign Body in the Lens Located with Roentgen Rays," a piece of steel which had remained quiescent for nearly four months (the lens being partially cataractous), which was accurately located by the x-ray according to Dr. W. M. Sweet's method. When the pupil was widely dilated, this piece of steel could be seen in the upper part of the lens, but could not be seen when the pupil had returned to its natural size. In other words, the localization with the ophthalmoscope and with the x-rays was identical, and the case was presented as an admirable demonstration of the value of Sweet's method.

Roentgen Rays in Dental Surgery.

Dr. William Rollins of Boston, in the *Electrical World and Engineer* has written briefly on the use of the Roentgen rays in dental surgery and illustrated the interesting article with plates and camera used in diagnosis. He says:

In Mr. Rice's article in the *Electrical World and Engineer* of April 22, it is stated that the application of Roentgen rays to dental surgery has been until recently little realized or developed. I take exception to this statement, as within a few weeks of Roentgen's announcement, I had constructed cameras to go into several of the internal cavities of the human body, including the mouth and they have been used for visual and photographic work by my friends and myself. They were duly described in hospital reports and dental and medical journals at the time. Beautiful work has also been done by Dr. Dwight M. Clapp, of Boston, on the teeth. He has shown various pathological and traumatic conditions of the roots. Dr. J. Edmund Kells, Jr., of New Orleans, has also published results, and has taken photographs of the teeth in which the exposure was reduced from minutes to seconds.

I have used the method as part of my routine work for three years, and have discovered several conditions of the teeth which could never have been known without it. For example, I have found that the so-callen Riggs' disease does not begin at the surface, as was believed, but that the first symptom is an absorption of the edge of the sockets. In fact, the use of Roentgen's discovery by the most progressive men in dentistry is constant.

Mr. Rice describes a method for photographing the teeth, which consists in taking an impression of the mouth in wax, and then trimming to a flat surface for the film to rest on and replacing the impression with the film in the mouth to take the picture. This takes more time and is otherwise inferior to my old method, some details of which are shown in the accompanying illustrations.

The oral camera is mounted on a ball joint, and has an aluminum window attached to a screw cap that can be removed to put in the celluloid films. There should be six of these. This multiple method is the invention of Prof. Elihu Thomson, and is of great value. I have changed it a little by putting between the films thin sheets of some partly "non-radiable" material so as to give each film a slightly different exposure. In this way the results on the average are better. All these instruments have been in practical use for three years.

The use of cameras and fluoroscopes for the internal cavities has been pretty well exploited, and as there is so much to learn in this field, no one can afford to duplicate old results. This is my reason for writing this, and which I hope Mr. Rice will pardon as not being intended in a critical spirit.

Dr. Rollins makes use of a camera for the rectum or vagina which takes strips of celluloid films. The sheath is made of aluminum which is transradiable and at the same time waterproof and opague to ordinary light. The oral camera consists of a soft rubber bag and opague to ordinary light and containing half a dozen celluloid films. It is closed water tight.

There are sliding metal tubes to adjust the eye distances and for transforming the Lenard-Roentgen light into ordinary light.

Radiography, With Special Reference to Detection of Renal Calculi.

C. Mansell Moullin.—*Lancet*, May 27.—The author speaks of the difficulty of radiography when photographing structures that lie deep in the tissues, such as renal and biliary calculi. He thinks it better to make thorough examination with the fluorescent screen before attempting to make the photograph. When both methods are used the screen tells a great deal more to the skilled observer than does the photographic plate. He is not prepared to say that this advantage of the screen over the plate will be permanent, as the art is still so immature. As regards the use of the coils or static machines for x-ray work, he considers it impossible to make any definite statement, but he speaks very highly of the Wimshurst apparatus. An advantage of this is that the current from it is quite harmless, and if the patient should get into the circuit no serious damage could be done, while a similar accident with the coil would be exceedingly inconvenient. Within the last few weeks, however, the use of a new principle — the Wehnelt electrolytic break—has greatly increased the power of the coil and enables us to obtain results previously impossible. As regards the renal calculi, the condition of the patient and the composition of the stone are both matters of importance. If the patient is thin and the calculus of oxalate of lime, positive results can usually be obtained. Phosphatic calculi are harder to detect and those of uric acid or urates still more so. If the patient is stoutly built and muscular, success is less certain. He thinks, however, with the use of the Wehnelt interrupter, better results will be obtained. In difficult cases such as these every endeavor must be made to reduce the thickness of the tissues by [illegible]gatives or enemata. The position [illegible] the patient is also a matter of importance. The erect position fixes the object better, but crowds the liver down in front and increases the antero-posterior diameter of the body. Moullin prefers to have the patient recumbent with the back well arched, and the light passed through in both directions, with a screen or plate used both in front and behind. To prevent movement of the calculus, from respiration, the patient is directed to hold his breath as long as possible and the exact distension of the thorax noted. Then he is allowed to breathe until he has recovered himself and then directed to hold his breath a second time with the thorax in the same state of distension. This is repeated as often as necessary, the light being only switched on during the period of apnea, when the thorax is at rest and the kidneys and the calculi are presumably occupying the same position relatively to the light. As regards biliary calculi, they are still more difficult, owing to their very low absorptive index. The difficulty is greatest when inflammation is most wanted, that is, when the calculus is not in the gall-bladder but in the ducts and when the patient is stout and the abdomen firm.

Potential Gradient at the Anode in Vacuum Tubes.

Skinner.—An investigation of the potential gradient within the luminous layer of 1 to 2-mm thickness covering and closely adhering to the anode. Both Hittorf and Graham (Digest, March 26, 1898,) had found that there is a sudden fall of potential between the metallic anode and the gas amounting to about 20 volts and increasing to about 40 volts within the first few millimeters. Skinner proves that the potential gradient within the luminous layer is infinitesimal, and that the greater the potential drop at the anode, the thicker is the anode layer. The anode drop depends upon the gas, the pressure and the material of the anode; it has the greatest values for those metals which exhibit the least difference of potential when used as cathodes.—*Wied. Ann.*, No. 8; abstracted in London *Elec.*, Aug. 25; *Elect. W. and Eng.*, N. Y.

Injury From Vacuum Tube.

Dr. Philip Mills Jones, of San Francisco, in the *Pacific Record*, gives five reasons to controvert the ideas set forth by Alfred C. Prentice, on the cause of x-ray dermatitis. His reasons are:

1. Dermatitis may result from an exposure to the radiant energy emitted from an excited vacuum tube.

2. We have a large, comparatively, amount of radiant energy being absorbed by certain structures.

3. We know that every change in energy will result in dermatitis in these tissues. (Either absorption or dissipation, for burn will result from heat or cold.)

4. It is at least possible that this absorption of energy by the skin cells may so modify the cells that they die, thus producing the necrosis which is known to be a feature of the dermatitis R.

5. That electrification, consequent or incidental to exposure in the neighborhood of a conductor carrying a high potential, either when the circuit is open or when it is closed, will produce any irritation, or any dermatitis R, has not been demonstrated, and in fact such an assumption is in direct opposition to the facts thus far noted by many observers.

Electrostatic Lines of Force.

Boccara.—Smearing the terminals of a discharge gap with a liquid such as castor oil, is a good method of showing the lines of force in the gap; the spray flies between the terminals in such a way as to demonstrate the direction of the lines of force.—*Nuovo Cimento* 8, p. 406; noticed in *Science Abstracts*, June.

Prof. Roswell Park makes the startling prophecy that if for the next ten years the present relative death rates are maintained, in 1909 there will be more deaths in the State of New York from cancer than from consumption, smallpox, and typhoid fever combined.—*Western Medical Review.*

It appears from the following, by Dr. Massey, of Philadelphia, on "The Cataphoric Treatment of Cancer," that the relative death rate will not be maintained:

Since the paper previously read before the section, 26 cases of carcinoma and sarcoma had been subjected to this method of treatment in some manner, many of them extremely bad cases—some forlorn hopes. Of these cases 10 were operable cases and these resulted as follows: Cured, 8; probably cured, 1; failed to be cured, 1. Of the inoperable cases there were cured, 2; probably cured, 1; failed to be cured, 13. He concluded as follows:

"(1) The massive diffusion of nascent mercuric salts within a growth of the body by an electric current constitutes a novel therapeutic procedure of great value in the destruction of foci of malignant or non-malignant germ growths when said growths are so situated as to permit of penetration and drainage.

"(2) This cataphoric destruction of the germs of a primary cancerous growth *in situ*, including outlying colonies and so-called roots of prolongation, permits the preservation of the unaffected portions of the organ in which it is situated, and offers greater security against a recurrence of the growth than efforts to remove the living malignant organisms by cutting operations.

"While the cataphoric method may be employed as a palliative in non-operable malignant growths and may at times cure them, its chief value is in the total destruction of the malignant germs in the early stages of primary growths and in the same stages of purely local recurrences."

X-Rays In the Transactions of the N. Y. Surgical Society.

At a State meeting of the Transactions of the New York Surgical Society, Dr. Curtis showed an x-ray picture of a fractured patella with pseudarthrosis which had been treated by wiring. An x-ray photograph was also shown of a cross-union of the radius and ulna. Dr. Curtis showed a radiograph which was misleading. The x-ray picture which revealed, apparently, a pin in the esophagus. The patient was a child who had swallowed a hat-pin, about two inches long, with a glass head. An unsuccessful attempt was made to locate the pin by the aid of the fluoroscope. An x-ray picture was then taken which apparently revealed a thin, dark body, like the shaft of the pin, in the esophagus. The picture proved to be deceptive, however, as the pin was recovered shortly afterwards in the stools, and the supposed pin was a defect in the gelatin of the plate—but not a mere scratch on the surface which could easily have been recognized. The case illustrates the necessity for care in the interpretation of the x-ray negatives.

Electrical Exhibition.

Each of the Electrical Exhibitions held in New York City of late years has been distinguished by some special feature. That of 1896 included the best public demonstration of the Roentgen rays, the transmission of power from Niagara, and the sending of a cable message around the world. The Exhibition of 1898 included a complete church, lit by vacuum tubes; the application of electricity to street-car traction, the first series of wax works ever made to illustrate the history of an art, the theatrophone, and the beginnings of wireless telegraphy. In 1899 the prominent feature was certainly antimobilism. Wireless telegraphy occupied a prominent place. Several valuable government exhibits were attractively displayed. They included apparatus from the Army and Navy, the Signal Corps and the Weather Bureau. A special department was devoted to electro-therapy.

Impersonation.

The discovery of the x-ray has been much to my advantage, for in substance I am so much more dense than my fellows that they have not yet succeeded in making me transparent, and the shadows which I cast in a skiagraph discloses my outlines perfectly, whereas there is not another one of the human shapes with which I am connected that enjoys this distinction. When any of my bones are broken, or diseased, or out of place, surgeons are able to find it out now much quicker and more surely than before, and consequently I am able to obtain more speedy relief than formerly.

I am just as proud as my brother tissues, for I am an indispensable member of the family, and what affects them affects me, and, on the other hand, whatever affects me I can tell you affects them also. In fact, when I am really in trouble and enter my complaints at headquarters, I always command a hearing, and very little other business can be attended to until my wrongs are righted.

Extracted from "Series of Impersonations," by Dr. E. H. Pratt.

A New Radio-Active Substance.

De Haen.—By extraction from a large quantity of uranium ore, he has obtained substances which possess the properties ascribed by Curie (Digest, Feb. 4,) to "radium," in an extraordinary degree. Two preparations have been made; one exhibits the properties of Becquerel rays, it excites fluorescence in a barium platino cyanide screen even across opaque substances, effects the photographic plate, makes air electrically conducting, and is itself strongly luminous. For the other preparation the excitement of the screen is more intense, whereas the self-luminosity is feebler. Both must be carefully protected from moisture.—*Wied. Ann.*, No. 8; abstracted in Lond. *Elec.*, Aug. 25; *Elect. W. and Eng*, N. Y.

The Value of the X-Rays in Detecting Small Renal Calculi.

Dr. Robert Abbe read a paper with the above title before the Transaction of the New York Surgical Society.

Dr. Parker Syms said that all surgeons appreciated the value of radiography in the diagnosis of renal stone when the picture gave a positive result. There are cases, however, where the clinical symptoms strongly point to the presence of stone, and in which the result of an x-ray picture is absolutely negative. The speaker asked Dr. Abbe what weight he attached to such negative results in the face of strong clinical symptoms.

Dr. Abbe replied that if a good x-ray picture, displaying ribs and spine well (perhaps corroborated by a second one), failed to show the presence of a stone in the kidney, he felt well satisfied that there was no stone of any size there.

Lost X-Rays.

Though the fluorescent screen is very faintly luminous, the Rev. Alexander Moffat finds that if the Roentgen rays were continuous instead of intermittent, they would exert an effect 500 times greater than sunlight falling perpendicularly upon a surface. Only four per cent of the energy impinging upon the screen is represented by the visible radiations, while the interval between two x-ray discharges is about 1,000 times the period covered by a discharge itself. A Georgia inventor, it may be noted, has produced a Roentgen ray lamp, which is claimed to yield an intense light from the bombardment of a covered magnet core by the cathode rays.—*Electricity*, London.

Photography in Natural Colors.

Light being now considered a mode of electricity, a remarkable invention in photography by Prof. Wood of Wisconsin, may be looked upon as coming within the field of electrical interest. Prof. Wood, by the application of purely scientific methods, appears to have at length solved the problem of photography in natural colors. Negatives of the three primary colors are taken, as in the Ives' process; but in printing from these negatives, a diffraction grating, with a definite spacing for each color, is superimposed on the negative. The printing from all three negatives is combined to produce a single positive transparency. When this transparency is viewed through a slit at the focus of the lens which concentrates the light, the object is seen in its true natural colors, which far surpass in brilliancy anything hitherto produced. Obviously these color photographs can be multiplied by the ordinary process of contact printing.—*Electrical Review*, London.

Electric Discharge in a Magnetic Field.

Broca.—He describes experiments from which he concludes that there are two sets of cathode rays, one which follows the helix around the direction of the lines of force, while the other follows the direction of the lines of force. His experiments support the views of Crookes as to the nature of cathode rays; they seem to consist of assemblages of molecules identified with those of luminous sources.—*Jour de Physique*, 7, p. 710; noticed briefly in *Science Abstracts*, June.

X-RAY EXAMINATIONS IN TUBERCULOSIS.—Williams reports several cases of the use of the x-ray in the diagnosis of pulmonary disease and, while not giving up other methods, strongly urges its employment as of value in detecting certain early abnormal conditions. He thinks the danger of x-ray burns is slight, if it exists at all when proper precautions are taken.—*Jour. Am. Med Ass.*

Effect of Currents on the Human Body.

Kath.—An abstract of a paper read before the Union of German Elec. Eng. There are two kinds of effects; the first is due to large currents, from two to seven amperes, and at high voltage, 1,000 to 2,000, the contacts with the body being good, as in the electrical chair used with condemned criminals in New York State; in such a case the nerve centers are definitely destroyed. The second kind of effect is due to currents from ten to a hundred times smaller, and death is then the result of a shock to the lungs; in this case, the victim can be saved if he receives proper attention promptly. Moist hands or feet, especially if the moisture contains acid, are of course especially dangerous. —*Elek. Anz.*, June 18.

Dr. Levison, in a most interesting article, has provided us with suggestions as to the diagnosis between rheumatoid arthritis and gout by the x-rays, and as to the treatment of the gouty joints by the electrolytic method. Thus electricity, which had long been known to be of considerable use, whether in the shape of the electric bath or of the constant current directly applied to the limb in cases of rheumatoid arthritis, has now found a yet more direct application in gout, since it addresses itself to the removal of the material which is the source of local irritation and pain.—Extracted from an original paper "On the Relation of Gout to Rheumatoid Arthritis," by Dr. Wm. Emart, London. Full text in *International Med. Magazine.*

Chemical Effects of X-Rays.—When photographic plates that have been exposed to the action of x-rays are afterwards exposed to light, the image undergoes reversal in the same way as if both exposures had been made to light, and the precise character of the phenomena depends on the relative magnitudes of the exposures. Plates exposed for some time to x-rays show increased sensitiveness to the less refrangible rays. An interesting communication on this subject was recently made by P. Villard in the *Comptes Rendus Hebdomadaires des Seances de l' Academie des Sciences*, Paris, Vol. 128, pages 237—239.

Energy Consumed in Vacuum Tubes.

Ebert.—Results of some measurements which support the view that the luminous phenomena in vacuum tubes are due to dissociations brought about by the cathode rays impinging on the gaseous molecules; the greater the valency of the molecule the greater the amount of energy required in its dissociation.—*Wied. Ann.* 3, p. 608; abstracted with some data in *Science Abstracts*, May.—*Electrical World and Engineer*, N. Y.

The X-Rays.

The reducing property of cathode rays has been shown by M. Villard to be due to hydrogen, the conclusion being reached, moreover, that the rays from the cathode are formed entirely of hydrogen. This suggests the novel plan of restoring exhausted vacuum tubes by passing gas through a heated platinum plate in the tube wall—such diffusion having been shown by Deville to take place rapidly.—*Electricity*, London.

Radiography in Pregnancy.—Varnier (*Ann. de Gyn. et. d' Obstet.*, April, 1899) reports his experiments on a number of living women and cadavers with the x-ray, to determine the presentation positon and posture of the fetus. This he accomplishes satisfactorily, after 6½ month's gestation. The fetal spine and extremities remain invisible, however. He first obtained a satisfactory contour of the fetal skull on February 13, 1899. —*International Med. Mag.*

The Application of the Roentgen Ray in the Diagnosis and Treatment of Coxalgia.

Josseraud (*Lyon Med.*, No. 46, 1898) has fully demonstrated the value of this method of diagnosis in the determination of the exact condition present in cases of Coxalgia, and the beneficial influence which it has had upon the treatment in these cases. He has shown that the skiagraph will demonstrate the presence of osseous lesions and detect sequestra, making it possible to determine the exact condition of the bone and the situation of the lesion, so that if it is simply cartilaginous, or in the incipient stage, it can be treated by extension and rest, while the presence of any grave osseous lesion makes it possible to operate and remove the sequestrum or diseased area of bone before symptoms are present that would indicate it under other circumstances.—*International Medical Magazine.*

Uric Diathesis.

Gave to a man with frequency of micturation, pain in back, and bloating of stomach and bowels; with rheumatic pains in limbs; sleepless and nervous; with full feeling and eructations after meals, Lithiated Hydrangea(Lambert's), in doses of two teaspoonfuls after meals, and the following:

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Vin. kola f ℥ ij
Tinct. chinchon. co. q.s. ft. f ℥ iv. Misce.

Signa. One teaspoonful, in water, before meals, and two teaspoonfuls before retiring.

He improved as if by magic; bloating, full feeling, eructations and all pain disappeared, sleeps well, and there is no undue frequency of micturation.

CHARLES H. SPRINGER, M. D.,
Cleveland, Ohio.

INTERFERENCE OF CATHODE RAYS.—Descriptions of experiments by means of which the author endeavored to measure the speed of propagation of cathode rays. By one method he found it to be the hundred and fiftieth part of the speed of light and by another the three hundredth. He continues to maintain that cathode rays are longitudinal vibrations.—Jaumann. *Sitz. Ber. Akad. Wissensch. Wein.*, 107, Part 2; abstracted, with illustrations, in the *Elek. Zeit.*, May 25.

CANAL RAYS.—Descriptions of an investigation made to study this phenomenon.—-Wehnelt. *Wied. Ann.*, 67, page 421; abstracted, with illustrations in *L'Eclairage Elec.*, May 27.

ROENTGEN RAYS IN SURGERY.—A brief summary of recent progress in the application of Roentgen rays in surgery. —Lond. *Elec. Rev.*, June 2.

A Want Felt and Filled.

If the doctor had never accomplished anything more definite in his life work than the relief of pain, than amelioration of human suffering, he would not have lived in vain. It is all very well to say that pain is physiological, that it is the cry of the nerve for more blood, yet its continuance can not be borne by the patient, even by the most heroic Spartan. Long continued pain is dangerous, and while, of course, we never wish to obtund and remove it so completely as not to be able to ascertain its cause and remove the same, yet, the best interest of our patient requires from time to time the administration of that which is opposed to pain. Remedies like opium, which relieves the pain and at the same time are exhilerating and alluring in their effects, are most ofttimes dangerous in the remote demoralization which they produce upon our patient. A remedy for the relief of pain which does not tie up the secretions, which carries with it no exaltation and no fascinations which tend in the direction of developing drug habits is a desideratum. Five-Grain Antikamnia Tablets certainly meet this necessity. Antikamnia is also more prompt and decided in its action in labor than opium, and has none of the unpleasant after-effects. It may be continued in smaller doses to control after-pains, and rather favors than interferes with the secretion of milk.

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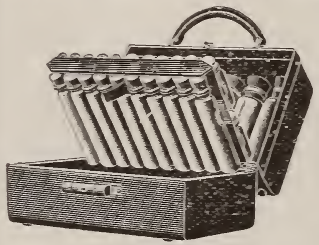

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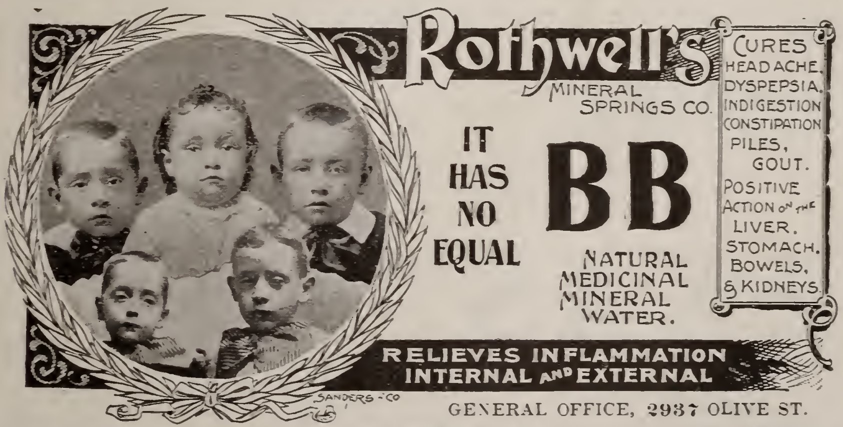
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SPECIAL REFERENCES—N. J. Colman, "Rural World," St. Louis; Robert H. Stockton, Majestic Mfg. Co., St. Louis; Heber Robarts, M.D., M.E., Editor of THE AMERICAN X-RAY JOURNAL, St. Louis; Wm. M. Tivy, Wholesale Commission Merchant, St. Louis.

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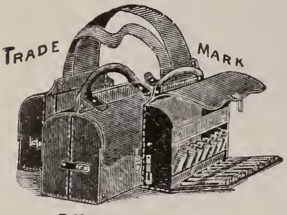

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Devoted to Practical X-Ray Work and Allied Arts and Sciences.

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WILLIAM H. MEADOWCROFT.

Mr. Wm. H. Meadowcroft, who recently severed his connection with the General Electric Co., has connected himself with the Parrot Storage Co., of New York City. Mr. Meadowcroft came to the United States from Manchester, England, in 1875. He had been employed in his native city in a law office and soon after arriving in New York entered the law firm of Carter and Eaton. He remained in this office five years and was admitted to the New York bar in 1881. Mr. Eaton, of the law firm, having accepted the vice presidency of the Edison Electric Light Co., Mr. Meadowcroft left the legal profession and took up the study of physics and practical electricity in the same company. He remained with the Edison Electric Light Company 18 years. In 1885 he started the incandescent lamp department of the General Electric Co. On the announcement of Roentgen's discovery Mr. Meadowcroft immediately began experimentations upon the same lines and for the purpose of making the results of his labors essentially useful for the physician and diagnostician. After going through the long course of experiments he finally brought out a line of x-ray tubes that have been pronounced the best obtainable for all round work. Prof. Elihu Thomson also patented the double focus tube in 1896, which Mr. Meadowcroft manufactured in large quantities. He also decided upon the type of exciting apparatus for x-ray work manufactured by the Electric Light Co., and had full charge of sales of all x-ray apparatus. The manufacture of the fluoroscope was also under his charge from the time they were first made. His practical work of making radiographs of all forms of accidents and injuries for the past three and a half years for hospitals, physicians and friends has reached the highest grade of excellence. The A. B. C. of the x-rays written by him in less than eight months after Roentgen's discovery sold all over the world and is still held as a standard primer on the subject of the x-rays.

Mr. Meadowcroft, on leaving the General Electric Co., was given a farewell banquet by his friends and associates of the Miniature Lamp Department at Harrison, New Jersey. He made a very graceful speech, in which he expressed his regrets at parting with them. In his new department he will probably be engaged much of his time in the manufacture of automobiles.

The American X-Ray Journal.

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VOL. 5. ST. LOUIS, NOVEMBER, 1899. NO. 5.

THE WEHNELT INTERRUPTER IN X=RAY WORK.

BY PROF. BENJ. F. BAILEY.
LABORATORY OF ELECTRO-THERAPEUTICS, ANN ARBOR, MICHIGAN.

To the possessor of a good induction coil, any method of increasing its efficiency for x-ray work is of value. The Wehnelt interrupter is particularly useful, as it does away with the costly and troublesome primary or storage battery, the mechanical interrupter, and the condenser, at the same time it greatly increases the capacity of the coil. It can be very cheaply made, and will operate on any commercial lighting circuit, either alternating or direct. A disadvantage is that the interrupter is not very durable, but a few minutes work will make a new one, so this is not a serious defect.

The essential parts of the interrupter are a glass jar of one part of sulphuric acid to four or five of water, a large sheet of lead to act as cathode, and the anode. This usually consists of a piece of platinum wire about No. 18 in size, with from one-eighth to one-quarter inch exposed to the liquid. It must be connected with the outside by means of an insulated conductor. The greatest difficulty is with this insulating covering as it is difficult to find a substance that will not be attacked. For the jar a good-sized tumbler will do, and a sheet of lead about four by three inches for the cathode. One method of making the anode is to seal a piece of No. 18 platinum wire about one-half inch long in the end of a short piece of glass tubing of about one-quarter or one-eighth inch bore, leaving about one-eighth inch projecting. The tube is then supported in any convenient way so that the platinum point is below the surface of the liquid. Innumerable modifications of this arrangement can be made. The cathode may be made entirely to surround the anode, or the end of the glass tube may be bent so that the platinum anode points toward the cathode. The platinum is apt to crack out of the glass, and it is claimed that if the wire is sealed in the bottom of a small beaker so as to get a larger quantity of mercury near the wire, this is not so apt to occur. The liquid heats up quite rapidly as about 200 to 400 watts of energy is consumed there, and to prevent it getting too hot, several devices may be used. One method is to make the cathode of a coil of small lead pipe, and pass cold water from the faucet continually through this pipe. This, of course, causes a slight grounding which might make some trouble if the supply circuit were badly grounded. Another method of construction is to solder end to end a short piece of platinum wire and a piece of copper wire of the same diameter, so that the combined wire is of the same diameter at the joint as at other places. The whole is then passed through a three inch piece of fibre tube, the bore of which it fits closely. The end of the tube is then heated and moulded around the wire, or some other method adopted to make a close joint. If the electrolyte can penetrate the joint, it will cause decomposition of the tube, but a tight sliding fit even will prevent this for a long time. The base of a burned-out incandescent lamp, if the platinum points are sufficiently far away from the metal base, makes an excellent interrupter for currents not exceeding about three amperes, and any number of them can be readily obtained.

The frequency depends somewhat upon the length of the platinum point and an adjustable interrupter is of course desirable. Such an instrument made in Germany was experimented with, but did not give entire satisfaction, as the liquid penetrated at the sliding joint and attacked the rubber fittings. The frequency is however easily regulated by varying the self-induction in circuit, leaving the point of the right size to carry the current desired, so there is no great need of such an adjustment when the interrupter is regularly used with the same coil.

The other accessories required outside of the coil are an inductive and a non-inductive resistance. The former may best be a water resistance. It consists of a glass jar of about a gallon capacity. A metal or carbon plate on the bottom is connected by an insulated conductor with the outside and another plate of the same substance is arranged so it can be immersed more or less in the water. The resistance can be lessened by increasing the immersion of this plate or by adding salt to the water. Any other variable non-inductive resistance can be used. Incandescent lamps would do very well and have the advantage of furnishing an approximate idea of the amount of current passing.

For an inductive resistance 200 turns of No. 18 wire wound on a bundle of iron wires 8 inches long and 3 inches in diameter will do very well. Taps should be brought out after 10, 25, 50 and 100 turns so that the number of turns in circuit can be easily varied.

Any good coil will work with the interrupter. If made especially for this use the primary will be wound with finer wire so it will require less current. The vibrator and condenser will of course be omitted. A ten inch spark coil wound for use with the storage cells in series will take about ten amperes. If wound for use with the interrupter two or three amperes will suffice.

To use the apparatus provision must first be made for a sufficient current supply. A lamp tap if provided with heavier conductors than the ordinary cords would furnish five amperes, but for ten amperes it would probably require heavier fuses. The non-inductive resistance, interrupter, coil, inductive resistance and a switch, preferably of the double pole variety, should be connected in series. An ammeter in the circuit is desirable but not essential. If an ordinary coil is used the vibrator should be screwed up so that it cannot act. This also short circuits the condenser. The discharge rods of the coil should be close together and the movable plate of the water rheostat at its highest point when the current is turned on. Gradually decrease the amount of resistance. If everything is all right, when the current reaches about five amperes the interrupter will begin to act. A bright light somewhat resembling the electric arc will appear around the platinum point, and a loud crackling sound will be heard. The discharge should also appear between the terminals of the coil. If instead of this the interrupter refuses to act and the platinum point turns a dull red, the connections are probably wrong and the terminals of the interrupter should be reversed.

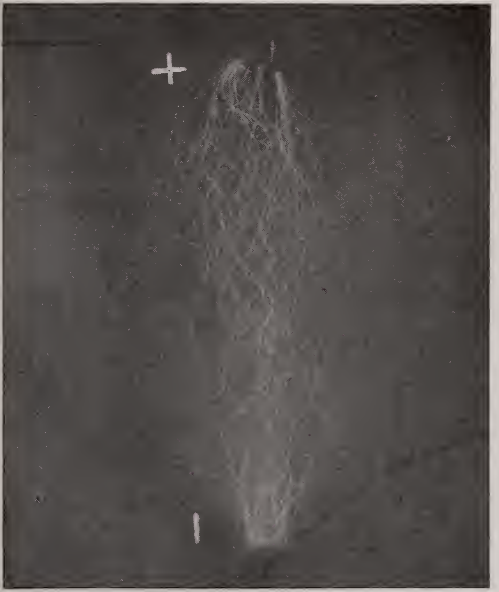

Fig. 1.

The appearance of the discharge is shown by Fig 1. The interruptions are so frequent that the output of the coil is greatly increased, and the character of the discharge is entirely changed. The photograph shows a distinct polar effect. The spark is thickened near the – end, and is there sharp and clear cut, while the + end is much blurred. A photograph of the ordinary induction coil discharge shows merely a wavy uniform line with no polar effect whatever. The frequency of interruption can be increased by decreasing the number of turns of self-induction in circuit. If cut down too much, however, the interrupter will refuse to act.

An ordinary single focus tube is the best to use. It is connected as usual to the two terminals of the coil, and the appearance and action of the tube are practically the same as with the ordinary interrupter, but the quantity of x-rays produced is much greater. If long exposures are to be made it is advisable to have two interrupters with a switch, so connected that if one gets too hot or refuses to act, the current can be switched through the other.

In one respect the Wehnelt interrupter is absolutely unique in that it can be used with the alternating current to give a unidirectional discharge at the secondary of the induction coil. It can be used in this way even more simply than with the direct current, and with equally good results. The connections are the same except that the inductive resistance is not needed. With 50 volts E. M. F. a coil and interrupter can be used without any external resistance, but on 100 or more volts a non-inductive resistance becomes necessary. The appearance of the secondary discharge is the same as with the direct current, and the terminals exhibit distinct polarity. A single focus tube should be used, and the connections are the same as before.

The reason for this marked polarity is I believe as follows: With 125 complete cycles per second the current falls from its full value to zero in $\frac{1}{125 \times 4} = \frac{1}{500}$ seconds. This with five amperes of current in an ordinary coil causes an E. M. F. capable of bridging an air gap of about one inch. With the interrupter in circuit the spark will jump six inches. The difference is due to the greater rapidity by which the interrupter breaks the current. Assuming that the E. M. F. is proportional to the spark length which is very nearly true for lengths above one inch, the time consumed in breaking would be about $\frac{1}{500 \times 6} = \frac{1}{3000}$ seconds. The breaks take place only when the current is passing from the platinum point to the lead plate. This accounts for the polar effects, as the E. M. F. generated by the regular alternation of the current is not sufficient to bridge the air gap or pass through the tube. If, however, the discharge rods be gradually approached to within about one inch the usual discharge will be succeeded by an alternating high tension arc, the E. M. F. generated being then sufficient in both directions to force the current across the gap.

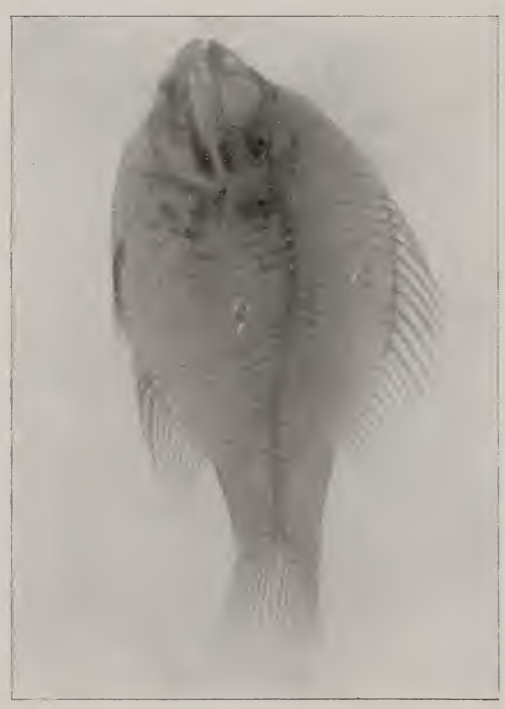

Fig. 2.

The radiograph of the fish was taken with the alternating current and a single focus tube. It certainly shows as good definition as can be obtained with direct current excitation.

No operator of an induction coil who has access to a commercial circuit, either alternating or direct, of any voltage not exceeding 250 should fail to try this method. The cost of the apparatus is small, and the results obtained will be well worth the trouble.

Sept. 25, 1899.

Restoring Impaired Screens.

Mr. W. S. Andrews, of Schenectady, N. Y., has kindly offered to restore impaired screens that are unvarnished. Fluoroscopes and open screens, after long use, careless handling or when exposed to artificial heat, become dull and brown. Sometimes screens lose their former degree of fluorescence and do not much change in color. All such screens Mr. Andrews will gladly receive for treatment. It will pay those in possession of such screens to correspond with Mr. Andrews.

Re-Enforcing Screens.

A. Lounde has determined, after a series of experiments, that the sulphide screens have an indisputable re-enforcing action. Screens made of platino-cyanid of barium, platino-cyanid of potassium and tunstate of calcium, have no particular action in this respect. While the sulphid of calcium and the sulphid of zinc do have re-enforcing action. Lound uses the sulphid screen for the detection of missiles in deep cavities or remote from the surface, allowing time for the re-enforcing action, which is about two minutes.

A Student of the University of Vermont is said to have instituted suit in the sum of $10,000 against one of the professors in that institution for injuries received from an exposure of a fractured leg to the x-ray, for the purpose of taking a photography of the injured member. The writ declares that, as a result of the exposure, discoloration of the flesh occurred, with subsequent atrophy of the tissues. All told, ten skiagraphs had been taken.—*Exc.*

St. Louis banks discount all checks 15c except from New York and Chicago. Do not pay in checks unless you add 15c.

A DOUBLE-FOCUS X-RAY TUBE FOR THE ACCURATE LOCALIZATIONS BY FLUOROSCOPE OR PHOTOGRAPHIC PLATE OF FOREIGN BODIES.

BY CHARLES LESTER LEONARD, A. M., M. D.

Skiagrapher to the University Hospital; Instructor in Clinical Surgery in the University of Penn.; Demonstrator of Roentgen-Ray Diagnosis in the Philadelphia Polyclinic Laboratories.

The detection and localization of foreign bodies in the tissues and various hollow viscera was one of the most obvious of the useful applications of the Roentgen-ray method of diagnosis.

This method can not be criticised for the failures that resulted from the inaccuracies of its early employment. The mathematical accuracy which has been obtained by various methods based upon geometrical principles is absolute. A method based on a series of triangulations was published by the author early in 1897. The technic required for its accurate application seems to have been a barrier to its general employment.

To simplify the application of the same principles the author has had constructed a tube having two cathodes and two anodes, and hence two sources of rectilinear rays. While avoiding the errors that creep in, where the position of the tube has to be changed in relation to the part examined and the plate or plates, it has also made rapid, accurate localizations by means of the fluoroscope easy. Localizations can be made with it without the delays necessitated by the development and fixation of the negative.

The fluoroscopic method of localization is as follows: The screen is fixed in a perpendicular position. The tube is placed so that the rays are discharged towards the screen in a horizontal plane. The mid point of the line connecting the two sources of light is perpendicular to the plane of the screen, at a known distance from a point on its surface marked by an opaque cross. This is all the adjustment that is required and can be readily made with a square.

The limb containing the foreign body is then interposed between the tube and screen and the shadows of the foreign body made to fall, one on either side of the opaque spot and equally distant from it on the same line. This places the foreign body on the line perpendicular to the plane of the screen at the opaque point. The opaque spot is then marked on the patient's skin with nitrate of silver.

By placing an opaque rod on the other side of the limb where its two shadows are equidistant from the opaque spot the perpendicular is found and marked on that side. The foreign body therefore lies on this line at a distance from the opaque spot that is determined by measuring the distance between the two shadows of the foreign body with calipers, and plotting the shadowy paths by the graphic process, as when plates are employed or by the cross-thread method devised by MacKenzie Davidson.

A rapid method of determining the result is to construct a table similar to the following, which will be approximately correct for each observation where the tube is at a certain fixed distance from the fluorescent screen.

When the mid-point between the foci is at a perpendicular distance of twelve inches from the screen and the foci are five inches apart, the distance from the opaque spot to the foreign body will be for—

1-4 inch apart, 5-8 inch.
1-2 inch apart, 1 1-4 inch.
3-4 inch apart, 1 3-4 inch.
1 inch apart, 2 1-4 inch.
1 1-4 inch apart, 2 5-8 inch.
1 1-2 inch apart, 3 inch.
1 3-4 inch apart, 3 3-8 inch.
2 inch apart, 3 5-8 inch.

The accompanying illustration shows the tube to have double cathodes and anodes. Two sources of rectilinear rays are thus placed at a known fixed distance apart in the same tube. They therefore produce two shadows of the foreign body upon the fluorescent screen as has just been discribed or upon the photographic plate, if that method of localization is preferred.

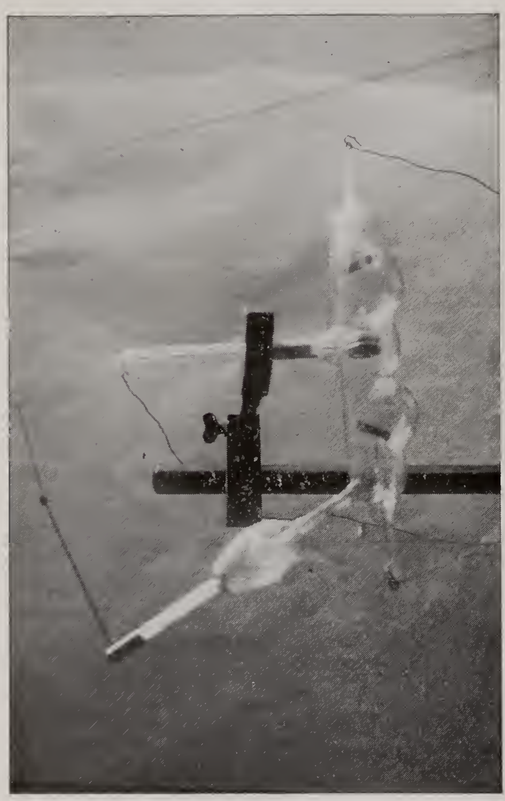

Fig. 1. Diagram illustrating method of employing localizing tube and determining results by the graphic method.

No other apparatus is required in making localizations and the errors that arise in shifting the tube or changing plates are avoided. Thus accurate localizations are produced by those who have little x-ray technic.

The method of employing it and of obtaining the result by the graphic method can be better understood by referring to the diagram.

The tube with its anodes AA^1 is placed at a measured distance, B E, above the photographic plate PP^1. The point on the plate, perpendicular beneath the midpoint E of the line conecting the two foci, is found by a plumb-line or square, and is marked by a lead wire cross, attached by a wafer to the plate wrapper at B. The shadow of this cross is the point from which the measurements are made on the plate.

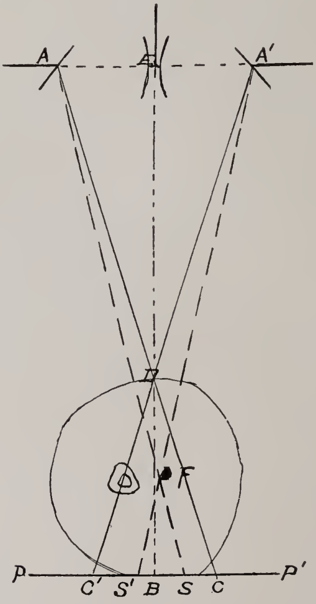

Fig. 1. Diagram illustrating method of employing localizing tube and determining results by the graphic method.

A mark is made on the patient's skin approximately in the transverse plane of the limb in which the foreign body lies. This spot is placed in contact with the lead-wire cross at B. A further point for measurements can be determined by placing a second lead-wire and nitrate of silver mark on the opposite side of the limb in the line E B at the point D by means of the plumb-line.

An exposure is then made. The developed plate shows the fixed point B and the shadows SS^1 of the foreign body F, while CC^1 are the shadows of the second localizing point. Our previous measurements and the distances of these shadows from the point B which can be readily measured, enable us to construct a diagram similar to the illustration for every case and to draw the lines AC and A^1C^1, AS and A^1S^1 which locate by their intersections the points D and the foreign body F. When such a geometrical figure is drawn from definite measurement the distance of F from B and D the nitrate of silver points on the patient's skin can be readily measured, which, with its distance from the line D B locates it with the accuracy necessary for surgical operation and removal.

The following mathematical formula will give the same results. In the triangles F A A' and F S S^1 let E B = H, F B = X, S S' = b and A A' = a—then

$$\frac{x}{H - X} = \frac{b}{a}\ ;\ \frac{x}{H} = \frac{b}{a+b}\ ;\ \text{or } x = H\frac{b}{a+b}$$

The result can also be obtained by the cross-thread localizer, or from a table constructed as in the fluoroscopic use of this tube mentioned above.

Clinical experience has demonstrated the accuracy of this localizing tube. A young lady had the point of a steel pin imbedded in her wrist. The x-rays had been used but inaccurately. The localization showed it to be 3-16 of an inch below the surface. A careful dissection at the point indicated disclosed it imbedded in a flexor tendon, with the point protruding inwardly and causing serious functional disturbance.

Several bullets had been located by it and the measurements found by operation to be correct.

1930 Chestnut St., Philadelphia.

There are 225 publications entered at the St. Louis post office as second class matter. Of this number one-ninth are medical journals. The American X-Ray Journal figures heavily in the gross weight. The total weight of all publications entered as second class matter for the quarter ending Sept. 30th amounted to 4,624,786 pounds. This is the lightest quarter of the year.

Neural Dynamics.

This is the title of a paper read by Dr. W. J. Herdman, of Ann Arbor, Mich., before the American Med. Ass. at Denver, 1898. Additional, the Doctor says: "Certain of these ether waves, those with a rapidity of vibration from 293,000,000,000,000 to 757,000,000,000,000 per second 'not only produce thermal and chemic effects, but have the power when they strike the retina of the eye of causing changes in the layer of rods and cones, which in their turn act as a stimulus to the optic nerve. The primary stimulus is here, as in the touch, muscular, auditory and temperature sense end-organs, a wave of motion communicated from an external source either by direct contact or through the medium of the air or the ether. If the rods and cones be wanting, as when the structure of the retina atrophies, ether waves, within the specified range for the normal retina, may beat upon the wasted surface continuously, but without avail in exciting light sensations. The peculiar structural or molecular arrangement which is present in the normally acting rods and cones of the retina is indispensable for the production of visual sensations, as likewise are ether waves of the proper rapidity.

While we do not know positively the nature of the change which takes place in any one of the forms of sensory end-organ so far considered, when acted upon by its appropriate kind of motion, analogies in physics and mechanics teach us that the end-organ is simply a machine devised for transforming that special form of motion into another form of motion that we term nerve-motion. The majority of the facts, which we have not now time to enumerate, appear to justify the conclusion that the first step in this transforming process is a chemic change, a re-arrangement in the protoplasmic molecules of which the cells in the end-organs are made up."

It is interesting to read some of these facts that have long since been conceded. The x-rays have complete vibration per second 288,224,000,000,000,000, which is a complete period beyond the ether rays that impinge upon the retina. Denial has been made that the x-rays in any way affect the cones and rods. But Prof. Roentgen observed visual effects from the x-rays when no fluorescent matter was before the eyes. Many other persons have observed the same. Dr. Astudillo, of Havana, Cuba, treated blind persons with the x-rays for the purpose of restoring sight. Of the twenty cases he treated, phenomena were observed in all. One case completely recovered, and others regained some sight. The structure of the retina had, in several cases, atrophied to the extent that light (expressed in 8½ octaves) no longer stimulated the rods and cones, and they therefore wasted. When the x-rays were used, they were sufficient to give impressions of light—and this stimulus to the retina brought on repair. The effect of the lesser light being inadequate to longer afford stimulus to the retina and secondarily to the optic nerve, the greater light, the x-ray has been found in some cases to supply the deficiency, and through its effect to restore the sight. This is analogous to starvation brought on by food not sufficiently rich in the essentials of life, but when supplied physical normalcy is restored.

Visibility of Roentgen Rays.

Mr. Dorn, whose experiments with the effect of Roentgen rays on eyes have been noticed before, describes some further researches in the *Wied. Ann. 66,* p. 1171, with totally color blind persons in which he found that such eyes may be very sensitive to Roentgen rays. In the case described in an abstract of the paper in Science Abstracts, February, the rays appeared of a nearly blinding intensity to the subject while they were only faintly luminous to the ordinary eyes. The results showed that the rods are more sensitive than the cones.

Lung and Heart Reflexes.

Abrams' paper is given to the description of two reflexes, apparently hitherto undescribed, on the part of the lungs and heart. A pulmonary neurosis of dilation can be produced by irritation of the nasal mucosa, e. g., firmly pressing cotton into both nasal cavities. He thinks this has a value in diagnosis as aiding in discovering regions of imperfect pulmonary expansion which exist. The heart reflex is due to irritation of the skin in the precordial region. It is only manifest by the Roentgen rays. The lung reflex can also be produced by cutaneous irritation, and he thinks this affords a therapeutic suggestion as showing the value of cutaneous stimuli, in bronchopneumonia for example, while he considers that the effectiveness of the Schott treatment in cardiac weakness is practically largely due to this action.

Physical and Fluoroscopic Examination of of the Thorax.

Dr. Stubbert concludes, after an exhaustive study of the diseases of the chest, that: 1. The fluoroscope is an accurate agent for corroborating and extending diagnoses made by ordinary methods. 2. It is capable of demonstrating foci of tubercular infection earlier than they can be distinguished by the ear. 3. It shows unilateral or bilateral enlargement or displacement of the heart. 4. Emphysema, asthma, pleurisy, hydro-pneumothorax and pneumonia are all easily recognized, and their limits demonstrated. 5. Thoracic aneurisms are recognizable in their early stages.

The Electrolytic Interruptor in X=Ray Work.

BY JOHN HALL-EDWARDS, L. R. C. P., F R. P. S.

Since the publication of my article upon the above subject in the British Journal of Photography I have continued to make experiments, the result of which I feel will interest those of your readers engaged in x-ray work.

The passage of the electric supply current through the interruptor is regulated by the following conditions:

1. The relative sizes of the electrodes.
2. Their distance apart.
3. The specific gravity of the fluid.
4. The length of platinum wire exposed.

In order to obtain any interruptions at all, it is absolutely certain that the lead plate must present a surface many times the area of the platinum wire. That there is no necessity, however, for the large surface of lead used in most interruptors, I have proved by experiment. With platinum wire (20 B.W.G.) half an inch in length, I tried lead plates offering a surface of from one to thirty-two square inches, and the ammeter (an exceedingly delicate instrument) failed to show any appreciable difference in the amount of current passed.

In order to test the effect of distance between the electrodes, I constructed an interruptor in a glass tank over two feet in length. With a solution of sulphuric acid and water of a specific gravity of over 1015 only a very slight difference in the amount of current passing was noticed, no matter how small or great the distance between the electrodes. With a solution of very low specific gravity (1005) much more current passed when only half an inch apart than when the distance was increased to four inches; between four inches and two feet, however, no appreciable difference could be measured.

So much depends upon the specific gravity of the electrolyte, that too much attention can not be given to this point. The amount of resistance offered by the interruptor can, by varying the specific gravity of the fluid, be regulated to the greatest nicety, and to such an extent as to render the use of a rheostat unnecessary. The experiments upon which these conclusions are founded were carried through with the assistance of Mr. J. C. Vaudry, the managing director of the Birmingham Electric Supply Company who kindly placed at my disposal a voltmeter and ammeter of exquisite sensitiveness.

The experiments were made with a nominal 110 volt circuit, which at the time was supplying a regular flow of 119 volts. The arrangement of the apparatus during the experiments will be understood by reference to the diagram (Fig. 3). The voltage of the current passing through the primary of the coil was measured by the drop which was registered across the interruptor.

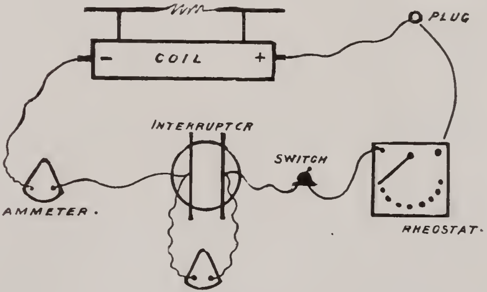

Fig. 3.

The vessel containing the interruptor was large, and contained 200 ounces of solution. The platinum wire was 20 B.P.W.G., and half an inch was exposed. The lead plate was 16 square inches and the distance between the electrodes was 3 1-2 inches.

In the measurements here recorded the rheostat was entirely cut out of circuit, the full 119 volts being passed through the interruptor.

With plain water, specific gravity

1000, the ammeter failed to give any reading, so that less than a quarter of an ampere passed. The voltage across the interruptor showed a drop to 115, thus 4 volts passed through the coil,* which gave a spark of only half an inch in length. The platinum wire in the interruptor gave off but a few bubbles and did not become red hot. Half an ounce of pure sulphuric acid was now added (specific gravity 1002), 3 amperes at 5 volts now passed a good supply of sparks 3 or 4 inches in length, passing between the sparkers. Sulphuric acid was now added, half an ounce at a time, until the specific gravity reached 1023, when 8.5 amperes at 13 volts was used. The spark now assumed the violet-blue color mentioned in my last article, and twisted about between the sparkers, which were placed about 8 inches apart.

A complete record of the experiments will be seen by a glance at Fig. 4.

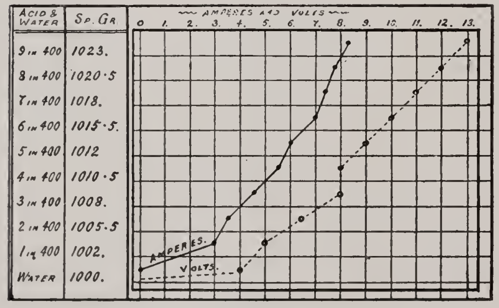

Fig. 4

These experiments prove that, with a platinum electrode of fair size, the interruptor can be completely controlled by varying the specific gravity of the solution, and, moreover, that the quantity of acid generally recommended is far in excess of that really necessary. A five per cent solution , which, with the acid I used, gave a specific gravity of 1048, required, with the same arrangement, an additional resistance of about 5 ohms before it could be used with safety. Under these circumstances, however, matters can be speedily rectified by cutting off a piece of the platinum wire.

From these experiments I concluded that a 220 volt current would be used, which conclusion was subsequently verified.

The length and size of the platinum wire used in the anode constitutes one of the most important points in the construction of the interruptor, as has to an extent been already shown. I have been called to task by a contemporary for recommending a wire so small as 20 B.W. G. This has, in my hands, proved so successful that I continue to use it. I have never had the apparatus stop working since I adopted it, and I rarely get a broken tube. In most of the bought interruptors a larger size is used, but experience alone can teach which is the better.

An interruptor in which the length of the platinum wire exposed can be regulated at will is a great advantage, as, by taking note of what has been said of the influence of the specific gravity of the electrolyte, any size coil can be worked from any current up to 220 volts without a rheostat. An adjustable interruptor is shown in Fig. 5. In this instrument the platinum wire passes through a small hole in a piece of china, or baked clay, the length being varied by the screw, A.

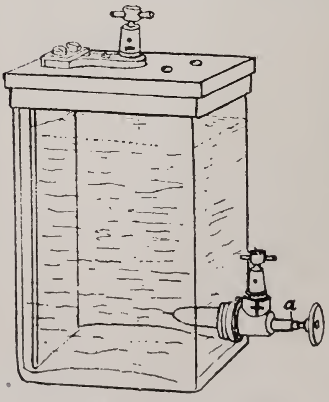

Fig. 5.

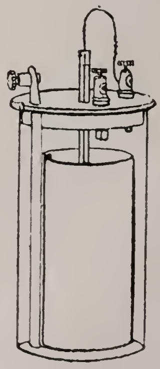

Fig. 6.

Fig. 6 shows a form of interruptor in

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*The coil, with platinum contact-breaker and 12-volt accumulator, gives a full 12-inch spark.

which the anode is surrounded by a cylinder of lead.

It must be kept in mind that a considerable amount of gas is generated when an interruptor is at work, and, moreover, that it is given off in the proportions necessary for forming water; hence under no circumstances should a light be brought near the vessel after it has been working for any length of time, or a serious explosion may occur. It is also very desirable that, in covered interruptors, large holes should be provided for the free escape of the gases, or an explosion may occur from internal pressure.

The behavior of Crookes tubes when worked with the interruptor is a matter of much interest. Small tubes are next too useless, as they heat very rapidly, and in many cases the vacuum is so much reduced after a few seconds' working that no x-rays are produced. They are not necessarily spoiled, as with the platinum contact-breaker the vacuum can soon be raised to the desired point again. I have purposely thus reduced the vacuum of several tubes I had put away as useless with a marked measure of success.

The tubes I have worked most successfully with the interruptor are large ones with a bulb of at least six inches in diameter. A medium high vacuum gives the best results, and it is an advantage to somewhat raise the vacuum of a new tube by means of the contact-breaker before using it with the interruptor. A tube in which there is a tendency for the vacuum to increase even when the anticathode is raised to a red heat is the ideal one for working with the interruptor, and is likely, with care, to last for a considerable time. In some tubes, owing, no doubt, to the presence of some metal in the solder which is easily volatilised, the vacuum is reduced to such an extent as to render them next to useless immediately the current is switched on; such tubes are perfectly useless for our purpose.

In several tubes in which the anti-cathode is composed of a fairly thick piece of metal, with a thin covering only of platinum, a hole has been melted through the latter metal before any indication of its reaching the melting point was observed. As long, however, as the thicker metal support was not melted, I have noticed no great falling off in their working power. No tube in my hands will run for longer than a minute when sufficient current is passed through to enable it to give a maximum amount of x-rays. The anti-cathode must be carefully watched, and the current switched off directly it assumes a full red heat. Fifteen to thirty seconds rest must be given before the current is again passed through. The having to switch on and off the current is a nuisance, which can only be avoided by a considerable alteration in the methods of manufacturing tubes.

I have noticed some curious phenomena in the working of tubes with the interrupter for which I can give no explanation. With the contact-breaker, or mercury interrupter when a tube reached so high a vacuum the sparks refused to pass through, they either jumped or brushed over the outside of the tube. When the same thing occurs with the electrolytic interrupter, the spark evidently passes through, as is seen by a small glow near the cathode end, or a bright spot somewhere on the surface of the glass, but no x-rays are produced, although no sparks are to be noticed on the outside of the tube. If, however, the tube be left working, it will suddenly be lighted up, and will continue to work until it has again rested, when the same process will have to be repeated.

When passing a large amount of current through a tube of high vacuum, a fine brush of sparks sometimes covers the whole surface of the glass. Several times when doing this I have noticed that a patch of glass about three-quarters of an inch in diameter exactly opposite the anti-cathode pole, and immediately beneath the cathode, has ceased to fluoresce, and in the brightly lighted tube appears as a black patch. From the centre of this a bright, fairly thick spark passes to the cathode terminal. On first seeing this I naturally thought that the tube was ruined, so put in resistance and allowed it to go on working. Much to my surprise, the tube worked steadily on, so I again repeated the experiment The spark in question appeared to come through the glass; at the same time the vacuum of the tube was not reduced. The experiment appears to be fraught with danger, but I mention it in the hope of getting some explanation of the phenomenon.

In using the fluorescent screen with the interrupter I have failed to notice any marked increase in the fluorescence, although its steadiness is a great advantage. In taking radiographs, however, not only does the necessary exposure appear to be lessened by the rapidity of the interruptions, but the power of the x-rays appears to be increased. If this is so, I take it that the reason why the screen does not show more is due to the fact that under both conditions the maximum amount of fluorescence is produced, and, in order to obtain better results in this direction, we must have improved screens.

The introduction of the electrolytic interrupter opens up new fields for research, and, apart from its application to x-ray work, it is likely to prove of great service to mankind.—*The British Journal of Photography.*

Subscription to the AMERICAN X-RAY JOURNAL is invariably in advance. The blue pencil cross-mark indicates delinquency. The small price of one dollar for this journal should not stagger any one.

Luminosity or Rare Earths Produced by Cathode Rays.

A Royal Society paper by Mr. Swinton is reprinted in the *Lond. Elec. Rev.*, June 2 He describes experiments made with a number of the rare earths when heated in vacuum and by cathode rays, in endeavoring to explain certain actions of these oxides. He found that thoria and ceria both alone and mixed, behave quite differently when heated by cathode rays than when heated by a Bunsen flame. Incidentally it may be mentioned that a rough estimate of the amount of light showed that there were at least 150 candles per square inch of incandescent surface at an expenditure of approximately one watt per candle. The conditions of maximum luminosity, however, were exceedingly unstable.—Swinton.—*Lond. Elec. Rev.*, June 2.

The Pineal Gland and Sexual Development.

Dr. Heubner, of Berlin, had the following interesting case: A boy, 4½ years old, presented the development of a boy of eight or nine years, as well as an abnormally large penis, well-developed scrotum and testis, the pubes being covered with hair. The boy suffered in infancy from spasms of the larynx, his speech developing slowly. Up to 7½ months the development was normal, the abnormal growth having taken place within one year after that period. He finally developed hydrocephalus, and, by means of the x-rays, a tumor was located in the neighborhood of the hypophysis cerebri. The boy died, and an autopsy revealed a tumor of the pineal gland.—*International Medical Magazine.*

Seeing with "Dark Light."

We have already described the experiments of Gustave Le Bon on what he calls "dark" or "black" light (lumiere noire), which consists, according to his account, of certain rays that remain after all the visible rays have been filtered out from ordinary light by an opaque screen, and which has some of the properties of x-rays. His first experiments, made several years ago, did not produce conviction in the minds of the majority of scientific men; many who tried to repeat them were unable to do so, and those who succeeded believed that the results could be explained differently. But M. Le Bon has continued his investigations, and some of his recent results, as described by him before the Paris Academy of Science, are made known in an article contributed to La Nature (March 25) by M. A. de Marsy, that we translate below. Says this writer, speaking of M. Le Bon's so-called "dark light":

"This invisible light, which is capable of acting on a photographic plate, includes many different kinds of radiation, which M. Le Bon did not have time to dissociate at the moment when he published his investigations. So his experiments, when repeated by others, were followed by contradictory results, and were variously interpreted by writers on physics.

"The author has continued his investigations, and in recent notes published in the Transactions of the Academy of Sciences, he has separated from the mass of heterogeneous and confused radiation called by him 'dark light,' a few clear elementary forms.

"In the first place he has studied invisible residual light, and has shown that dark bodies can be photographed in darkness by means of the totally invisible light that they store up after a short exposure to sunlight. He has proved experimentally that this light is refracted, is polarized, has a spectrum like that of ordinary light, and preserves its photographic properties more than a year.

"This point established, he has studied the transparency of opaque bodies for different luminous radiations. That the eye may see through an opaque screen we must evidently have two conditions fulfilled: first, some rays must pass through this screen, and, second, the eye must be made sensitive to these rays.

"By certain artifices, which he described elsewhere, the author has succeeded in making the photographic plate sensitive to the obscure radiations. Having then obtained photographs through opaque bodies, he naturally concluded that some luminous rays passed through the latter.

"But the exposures at that time lasted several hours and it was necessary to operate by contact. The results thus might be interpreted in all sorts of ways.

"Pursuing his researches, the author finally found a reagent whose sensitiveness is five thousand times greater for invisible rays than that of the photographic plate. Having obtained his result, he has been able to show in a few seconds the transparency of the most opaque bodies, and to render visible an object placed behind a screen or shut up in a box, taking as source of light a simple kerosene lamp entirely enclosed in black paper. The sensitive reagent is the phosphorescent zinc sulfid prepared by the method of Charles Henry. It is laid upon a translucent or opaque screen by mixing it with varnish.

"Such a screen has very curious properties. Exposed to the light of day it phosphoresces; but if certain rays be separated from the visible light by passing it through proper screens, the invisible rays thus filtered out extinguish the phosphorescence instantly, and do so proportionately to the thickness or the nature of the interposed screens. Now these extinguishing rays (whose wave-length M. Le Bon has determined by a method that we shall not explain here) are the ones that can pass through opaque bodies.

"The image obtained by interposing the screen between the source of light and the opaque body lasts only a few instants, and is visible only in the dark. To make it lasting and transform it into an ordinary photographic impression, we have only to place the screen for thirty to forty seconds against a gelatin-bromid plate, which is then developed by the usual methods.

"The times necessary to obtain an image through various substances are as follows: ebonite, 1 centimeter (0.4 inch) thick, ten seconds; four sheets of black paper, ten seconds; marble, 2 centimeters (0.8 inch) thick, five to thirty seconds; board, ½ centimeter (0.2 inch) thick, sixty seconds; twelve sheets of red paper, seventy seconds, etc.

"Of all the bodies investigated, only lampblack (except metals, which the author reserves for another series of experiments) appeared to be opaque. Bodies containing it, such as certain kinds of black paper and ebonite, were opaque for this reason. Making use of this opacity of lampblack, the author was able to photograph a design in printer's ink placed in an envelope of black paper deposited in an ebonite box. This photograph was among those that he exhibited at the Institute.

"As most of the rays that pass through opaque bodies are invisible ones, it follows that we can screen off the visible rays of the source of light, and that this may be, as mentioned above, a kerosene lamp surrounded with black paper. In absolute darkness the observer then sees on the screen (sensitized previously by a short exposure to daylight and placed against an opaque box) the object shut up in this box. The best results are given by boxes whose ends have been replaced by black paper, or better still, by ebonite. . . . .

"One of the published photographs shows that the spectrum of the radiations that pass through opaque bodies is much more extensive than that of the radiations that do not so pass. It reaches from (wave-length) 0.7 to more than 1.5, according to the author's measurements. Since the visible rays of the spectrum destroy the action of the invisible rays, the author concludes that to study the physiologic action of these latter on plants and animals, we must separate the two kinds of radiations. We shall probably have occasion to speak of the experiments that he is now making on this point."—Translation made for *The Literary Digest.*

Bullet Retained in the Heart.

BY DR. A. G. PODRES.

A sixteen-year-old girl shot herself accidentally in the heart with a pistol, and two hours later was admitted into the clinic. Heart action almost stopped. Wound at junction of sternum and fifth rib on the left side. The wound was enlarged and drained, but as improvement was only temporary, an operation was undertaken. On opening the pericardium, a longitudinal wound was discovered in the right ventricle. Needle punctures to locate the bullet were unsuccessful. Then the heart was palpated carefully between the two hands, but no bullet could be found. As the wound was already scarred over, no sutures were made. Eight weeks after the operation the wound had entirely closed. Three months later the patient was reported well. An x-ray taken three months after operation plainly showed the bullet in the lower half of the right ventricle, with which it moved synchronously.—Exc.

HEALTH BUDS.

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All classical authors admit that when a large pleural effusion on the left side displaces the heart so that the beat is felt on the right side of the sternum, the axis is thrust back more than the base, the axis is straightened up, making itself at first vertical, then reversing its direction so that in extreme cases the apex reaches to the right mammary line. Professor Bard, of Lyons, has contended for several years that the heart is displaced en masse without any change in the general direction of its axis, and that it is the base and not the apex that beats to the right of the sternum. This opinion, drawn from clinical observation, has been confirmed by the use of the x-rays and several necropsies. In the case of a man thirty years old, having a cold abscess of the right pleura containing at least 5½ litres of pus, the heart beat to the right of the sternum in the second, third, fourth, fifth, and sixth intercostal spaces; in the sixth space it beat 15 centimeters (6 inches) to the right of the median line. Upon radioscopic examination the left side showed entirely opaque, and in marked contrast to the brilliant clearness of the right side the shadow of that portion of the displaced heart which projected beyond the sternum. Two essential features showed that this shadow belonged to the base of the heart; it was limited by an almost semi-circular contour and did not show the quite distant movements noticed in the image of the apex of the heart, but only feebly distinct movements. Comparison was made with a case of congenital dextrocardia, and a great difference in the radioscopic image was marked. Thus the x-rays have established beyond a doubt that the opinion of M. Bard is correct: the heart is displaced en masse without a change in its axis.—*Arch d'Elect. Med.*

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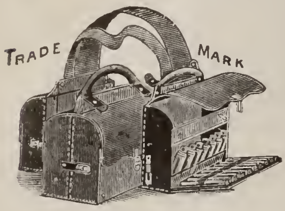

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THE AMERICAN
X-RAY JOURNAL.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

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PHOTOGRAPHS "AND RADIOGRAPHS."*

PROOF OF ACCURACY ESSENTIAL TO ADMISSION AS EVIDENCE.

In Cunningham v. Fair Haven & W. R. Co. (43 Alt. 1047) the Supreme Court of Errors of Connecticut held that, in an action against a Street Railroad Company for negligence in allowing the rails of its track to project above the roadway, a photograph of the street, including the place of accident, is not admissible to show the height of the rails and the condition of the roadway, without any evidence as to its accuracy.

Justice Hammersley, voicing the Court's consensus, among other things, said that, a photograph offered for the purpose of proving the appearance of a physical object which cannot be produced in court, nor inspected by the jury is secondary evidence. Its correctness or accuracy, like that of a map or diagram, must be proved before it can be received. Alberti v. Railroad Co., 118 N. Y. 77. In Dyson v. Railroad Co., 57 Conn., 9, 14, 24, the offer of the photographs was accompanied by the evidence of the photographer who took them as to their accuracy, and of a surveyor who identified the points of view. The accuracy sufficient for the admission of a photograph as evidence is a preliminary question of fact to be determined by the Trial Judge, and the testimony of the photographer is not essential if other evidence is produced, which, in fact, convinces the court. McGar v. Borough of Bristol, 71 Conn.—. It seems to be held in Massachusetts that the action of a trial court upon the proof of sufficient accuracy can never be reviewed by an appellate court (Hamlin v. Morse, 162 Mass. 414), although it may be by the jury (Marcy v. Barnes, 16 Gray, 161, 164). We do not see how this preliminary question differs from any other where questions of fact and law are intermingled. Questions of general policy may be involved, and these are usually questions of law; and for other reasons the conclusions of the trial judge may be so clearly against the law that we can, to a certain extent, review them,—as in cases of finding in respect to a reasonable notice to take depositions, or a diligent search for a lost document. Nolan v. Railroad Co., 70 Conn. 159, 190. The proof of accuracy varies with the nature of the evidence the photograph is offered to supply. When it is offered as a general representation of physical objects as to which testimony is adduced for the mere convenience of witnesses in explaining their statements, very slight proof of accuracy may be sufficient; but when it is offered as representing handwriting which is to be subjected to minute and detailed examination, or any object where slight differences of height, breadth, or length are of vital importance, much more convincing proof should be required. It is common knowledge that as to such matters, either through want of skill on the part of the artist, or inadequate instruments or materials, or through intentional and skillful manipulation, a photograph may be not only inaccurate, but dangerously misleading. Hynes v. McDermott, 82 N. Y. 41. Geer v. Mining Co., 134 Mo. 85; Taylor's Will Case, 10 Abb. Prac. (N. S.) 300, 318; Eborn v. Zimpleman, 47 Tex, 503. In the case at bar the photograph was not offered as a mere general representation of the locus in quo. For that purpose it was immaterial, if not irrelevant. A map was appropriate for such purpose, and that appears to have been in evidence. Its only relevancy as evidence was to show the height of the rail above the surface of the ground where the accident took place. Was the rail several inches above the ground, as stated by the witnesses for the plaintiff, or 1⅛ inches on the inside, as stated by the witnesses for the defendant? Instead of an inspection of the ground and rail, a picture is offered. It is evident that for such purpose a photographic picture might be most deceptive, and that reliable proof of its accuracy should be produced, and found sufficient by the judge. We are not now called upon to determine the legal correctness of a finding of this kind, nor whether it can be reviewed. The question presented by the record is whether it was error to admit this photograph without any evidence of its accuracy. We believe no case can be found which warrants such action. It must depend on the assumption that a photograph in all cases is to be regarded as an accurate representation, unless the contrary is proved,—an assumption opposed to all authority. The plaintiff undertook to lay the foundation for the introduction of the photograph as evidence, and for this purpose produced testimony tending to show the condition of the place of the accident was the same when the photograph was taken, as on the day of the accident; and produced no other testimony. The court thereupon, against the objection of the defendant, admitted the photograph. The ground of objection strongly urged by counsel, that this photograph could in no event be admissible in evidence, went, perhaps, too far; but he did distinctly urge that it did not correctly represent the rails. The record was a little blind, but it appears that the court admitted the photograph without any evidence of its accuracy, against objection on the ground of its inaccuracy, and apparently upon the theory that, the identity of the place being proved, a photograph is admissible without proof of its accuracy, which is error.

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*Quotation by Ed

The above editorial, from the *Chicago Law Journal,* is copied in full because it expresses the counterpart of x-ray pictures that must soon occupy the attention of the courts. In nearly all of the States radiographs have been introduced in lower courts and admitted as evidence. We do not know of an appeal having been taken, based upon the inaccuracy of the picture, nor can we recall an instance in which objection was made followed by proof of the picture. In fact, it does not seem as if the judge and counsel had contemplated inaccuracy, but rather accepted the appearance of things much as if viewing a photograph, believing that it fairly represented the conditions. Every lawyer knows that it is wrong to admit a picture, photograph, a map or a diagram if the opposing counsel objects, unless the same has been proven to be correct. With a diagram or drawing it is readily seen how easily error might occur, but with the photograph not so easy. On this subject, out of the human body, we will not occupy space. Concerning the anatomy it is all important that physicians should be informed as to its relation to radiographs. It will not do to be ignorant when before the court, testifying upon the accuracy or inaccuracy of our own radiographs. In medicine and in surgery we can be evasive, and thereby escape many a lash, but not so with work which is purely mechanical. X-ray pictures, I am sure, will no longer be accepted as evidence in courts of law when lawyers find that they have been heretofore deceived, unless the accuracy of their appearance can be proven. The proof of such a picture can not be contending evidence based upon mooted questions, neither can it be tainted with doubt, technicalities or double meaning phrases. The writer believes that the x-rays will mark the first period of time when medico-legal evidence will go before a jury or the judge in simple language and with positive understanding, and thenceforth, too, not as now, physicians may be said to be good witnesses.

An x-ray picture is a shadow without thickness, but it has perspective. The latter, however, can not concern a lawyer as that is purely diagnostic and technical. The dense shadows we will be called upon to explain.

We have a shadow that is not quite true due to the divergence of the x-rays from the anode. This is normal divergence, for it is constant and does not vary. This divergence might be sufficient, if the object to be examined was far from the sensitized plate, to considerably change the exact character of the object to be pictured. There is another divergence which is really a distortion, because it is due to position. These two conditions make a picture treacherous, uncertain and sure to misguide. The shadow we are to receive upon a plate will be distorted precisely in the same manner as an object interposed between a candle and white wall. We can well recall the grotesque shadows we made on the wall with the fingers of the hands in childhood days, or were made by grown persons for our amusement.

They practically illustrate the error possible in x-ray work of to-day, in the possibility of distortion—either designed or accidental. If we examine a fracture or dislocation, or look for a bullet with the fluoroscope, and the body is fixed, the object to be examined will appear to be fixed also; but the slightest rotation will shift the shadow and change its outline, giving the appearance of fixation at another site. This movement can be effected at will. Should the object to be examined be near the screen, rotation of the body will not be attended with much distortion, but greatly so if far removed.

It is in this manner that erroneous opinions have become current; to the effect that a sound bone may be made to appear fractured and a fractured bone sound. In neither of these cases can this be done unless some extraneous device is employed. Fractures and dislocations can, however, be made to appear grossly exaggerated, or such malcondition may be made to appear in almost normal position. An operator ignorant of anatomy and of the principles of divergence may do either of these innocently. This is a vital point on which medico-legal cases will hinge.

It became apparent that unless distortion by position and normal distortion could be corrected it would be unsafe to employ this means in diagnosis for the surgeon and worthless, if not dangerous, in courts of law.

It should be here mentioned that if the light, or what is known as x-radiance, is only sufficient to cast a shadow dimly of the bones, then it is possible for a fracture to appear sound. But poor radiographs are not, or should not, at any time be admitted for examination or for evidence.

The diagram Fig. 1 shows three positions of the tube with the fractured object stationery. It is apparent that the object could be shifted and produce the same shadows with a stationery tube. In fact, this is the manner by which most all distortions are made. The sensitive plate is placed in the diagram distant from the object to more clearly represent the diverging lines. It is clear that if the object was against the plate the fracture would not be proportionately altered. In one position 1 to 1′ there seems to be no fracture. This would not be exactly true in a good radiograph, for the cancellated structure would be interrupted and at this point would be detected by physicians, but not by laymen. The angle of separation is distinctly seen at 2 to 2′ and much more marked at 3 to 3′. The shadow is upon a smooth surface and flat, so that the angle is not recognized except by an expert. Experts are not wanted for that complicates the case for jury inspection. We must prove a picture by showing that the two arms of an impervious device fall in parallelism before the rays and cast a single shadow across the object. This will show the best possible position from two sides on the same plane. In this plane another picture should be taken at right angles to the first, which will give in the two pictures four views of the injury or missile, and in a line exactly with the shadow of the arms of the impervious device. This gives right angles and cross sections which are mathematically correct. It quickly familiarizes the mind with the conditions. Such an apparatus can be carried in the hand and its practical application shown to the jury. It readily convinces, because its shadows are as simple as those made by the hand on the wall.

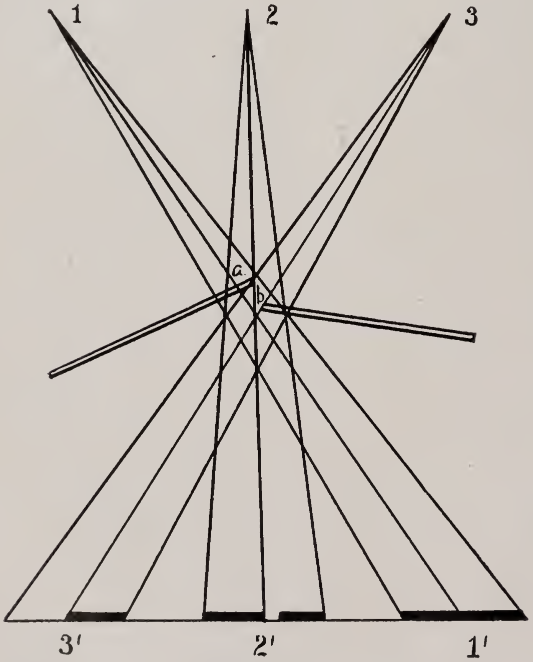


Fig. 1.

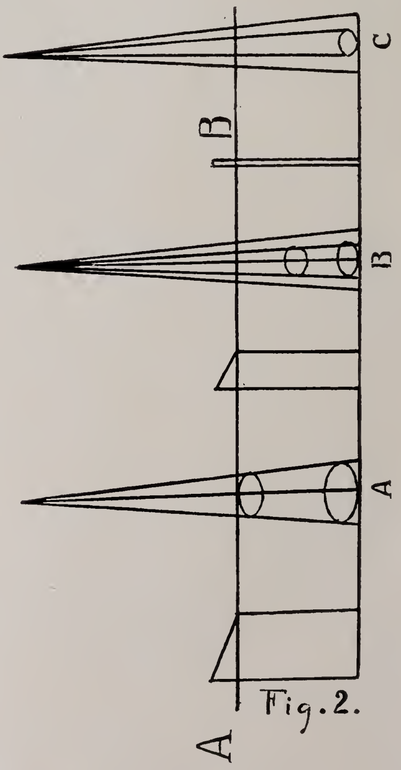


Fig. 2.

Fig. 2 diagram A represents the arms of the impervious device, and B the same brought into parallelism of the x-rays. A, B, C shows that the object distorts in proportion to its relation with the plate or screen, and that the distortion is twofold, viz., by divergence and by position.

In the case of the photograph mentioned in the *Chicago Law Journal*, the judge erred in accepting the picture when objection had been raised. He reasoned that the picture was that of a familiar place, and was not in himself broad enough to see that a specific point of the picture failed to reveal the truth, and was therefore inaccurate and failed of its intent and purpose. It is this same thing that will be contended of radiographs. They must have the stamp of proof to be accepted in courts of law, and without this proof they are worthless.—Ed.

X-Ray Equipment.

In connection with the Protestant Hospital and Ohio Medical University a first-class x-ray apparatus has been provided. This important method of diagnosis has become indispensable to surgery, and with improvements yet to be developed will, no doubt, soon bear the same relationship to medicine. In hospitals and colleges of consequence the x-ray apparatus is indispensable. By its aid fractures and dislocations may be unerringly diagnosticated, foreign bodies correctly located, diseased bones examined, and many other instances embracing a wide field of usefulness in point of accurate diagnosis and succesful treatment. Students will have repeated opportunities to observe the practical application of this important method of diagnosis. The x-ray apparatus is in charge of Professor Waters.

The above is taken from the catalogue of the Ohio Medical University. It indicates the advance step this splendid university has taken. Students of this university can be confident that they are being taught abreast with the times.—Ed.

Static Spark on X-Ray Plate.

It is said that Dr. Wagner was the first person to get the impression by placing the sensitized plate between the sliding electrodes of a static machine. It appears that Mr. Gates, of the Smithsonian Institution, wrote his article, which appeared in the *Cosmopolitan*, after Dr. Wagner had made these same experiments. The illustration shown in the R. V. Wagner & Co. advertisement is a beautiful display of an electric spark from a static machine made upon an x-ray plate.

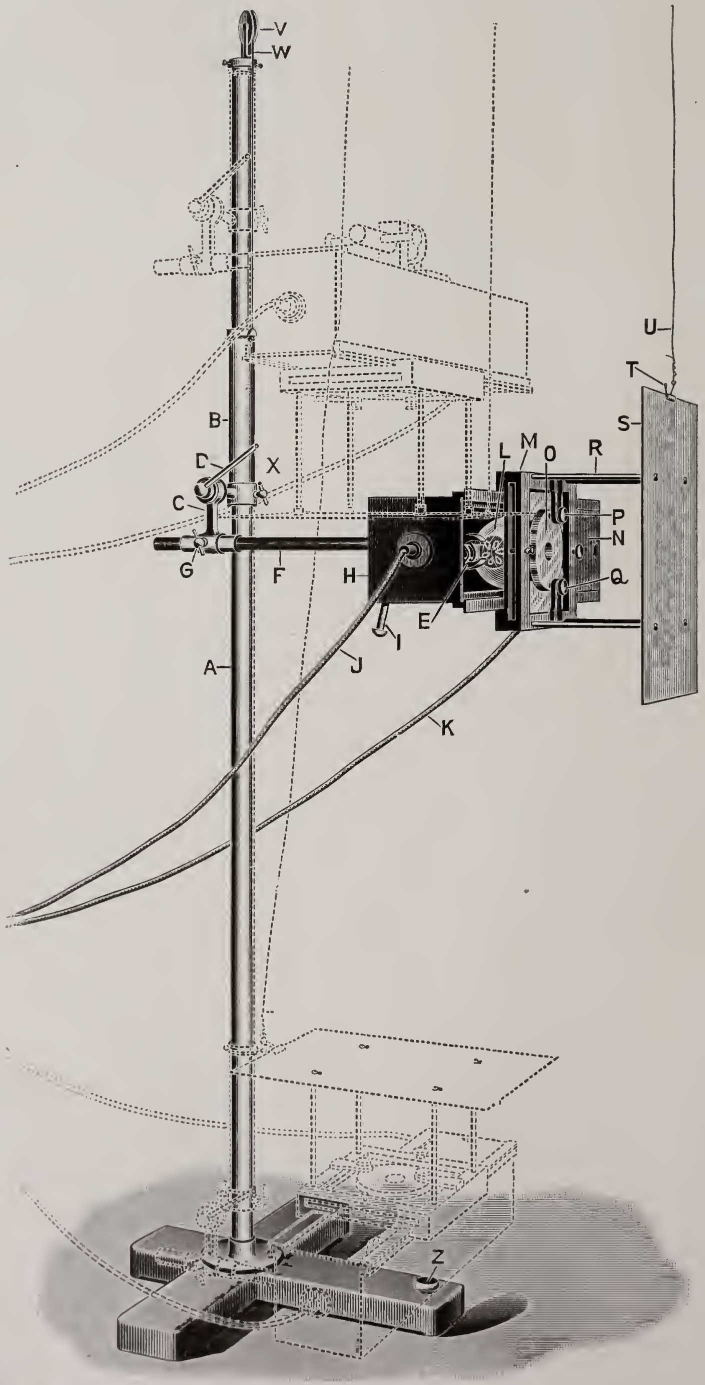
The "New Synergistic Medication" of the Antikamnia Chemical Co. appeals to the medical profession with rare favor. It has long been known that Antikamnia can be used with vegetable cathartics, and has been so prescribed, but the inconvenience and uncertainty of obtaining at all times just what was wanted has had much to do with retarding this form of medication. Antikamnia Laxative Tablets and Antikamnia Quinine Laxative Tablets are two most acceptable preparations put up in tablet form by the Antikamnia Chemical Co., and will meet the want so much felt by the medical profession.

It is with a great deal of pride we are able to embellish our portrait page with a half-tone of Dr. S. H. Monell, of New York City. Dr. Monell is regarded as one of the foremost thinkers of the world and in electro-therapeutics has done more for static electricity than any living man. His voluminous writings have made for him a living history. His books on the use of electric currents in x-ray work and in electro-therapeutics, so essentially personal, has had an enormous sale. As an author, teacher, scholar, he is at the top, and yet in the prime of life, battling for greater achievements,—as he says, "I am not half done."

A TUBE HOLDER.

BY DR. WILLIAM ROLLINS.

An x-light tube fills a room with a shining mist to which a photographic plate is sensitive though enclosed in a light tight case. Not to protect a plate from this is like trying to take an ordinary photograph without a camera to cut off all light except what comes through the lens. As far as possible therefore the patient should be covered



by a non-radiable screen having a hole to admit the narrow cone of rays required to light the part to be photographed. A second important matter is to have the tube enclosed in a comparatively non-radiable box so that no x-light can escape except what comes through a small opening in the attached diaphragm. This box should be so arranged as to be capable of being put in any position in relation to the patient. The accompanying figure shows a convenient tube holder.

A is a hollow brass tube two inches in diameter, attached by a screw thread to a strong base. This tube is high enough to allow the tube box to be brought as high as the head of a patient in an upright position. Inside the upright is a heavy lead weight to balance the whole tube box and attachments, so that they stay in any position. A cord going over the pulley V connects the weight with the sleeve B, which has ball bearings to prevent from binding. The dotted figures show the positions the tube can be put in to bring it above or below a patient on a stretcher. The tube is held in the box by soft rubber bands going over U-shaped supports. M is the diaphragm holder sliding along the tube box to bring the opening of the diaphragm O opposite the radiant area on the target. The screws P and Q allow the diaphragm to be moved up and down. The removable wood supports R hold the Tesla screen S to which is connected the grounding wire U by the clamp T. J and K are the mains which pass through hollow rubber sleeves in which they fit reasonably tight. These sleeves are tapered on the outside so they can at any time be removed from the hard rubber disks in each end of the box which help to insulate the mains. As these arrangements hold the mains firmly, it is quite unnecessary to do more with the terminal wires than to simply bring them in contact with the terminal loops of the tube; if the mains get pulled about in the dim light of the x-light room, there is no danger of injuring the tubes where the loops are attached. G is a sleeve which allows the rod F to be moved forward and back. C permits the tube box to move through vertical arc and D clamps it.

WHERE IS THE FOCUS OF THE CATHODE DISCHARGE?

BY DR. WILLIAM ROLLINS.

Soon after Roentgen's discovery that Lenard's rays would penetrate the human body was announced, I found in experimenting with tubes that the statement of Crookes to the effect that the focus of the cathode stream was at the centre of curvature of the cathode, because the "molecules" were given off perpendicularly to the surface was not correct for the degree of exhaustion best suited for the production of x-light. I therefore placed the target on which the cathode discharge was to strike to produce x-light beyond this point. This form of tube has been copied by all makers because it has been found necessary for producing the best definition, the sharpness of the shadows depending upon having the radiant area small; which it cannot be if the target is placed in the centre of curvature of the cathode. In Note 3, in the *Electrical Review* for December 8, 1897, I explained why the focus was not at the centre of curvature, and should not now refer to it again, were it not for a recent occurrence which shows that this reason is not generally understood, though the practical benefits resulting from the observation are to be found in the tubes in every day use. A physicist recently, in consulting a tube maker in regard to new forms of tubes, desired to have the targets exactly in the centre of curvature of the cathodes, because, he said, this would give better definition than could be obtained with the present tubes where the target was beyond this point. Now the reason why the focus of the cathode stream is not at the centre of curvature is a necessary correlate of the generally accepted theory of the cathode stream, namely that this is composed of particles which are repelled from the cathode because their charges have like sign. For the same reason they must repel each other, the effect being to make them come together beyond the theoretical focus; the distance depending upon the intensity of their charges and on the degree of the vacuum. For practical purposes the focal point is twice the distance of the theoretical focus, that is, with a cathode having a curvature whose radius is one inch, the target should be about two inches from the cathode.

X-ray and Renal Calculus.

Leonard calls attention to the value of the Roentgen ray method of diagnosis in cases of renal calculus, pointing out the necessity of a careful adaptation of the light and exposure to the individual case. The shadows produced vary so slightly in their density that great care must be exercised in reading the negative. All that is essential to an absolutely positive or negative diagnosis are two or three negatives in which the details of the softer structures are clearly defined. When the renal outline can be made out it is certain that no form of calculus can escape detection, showing the possibility not only of detecting calculi that are present, even in their incipiency, but also to demonstrate the absence of all calculi, no matter what their density. When calculi are known to be present, it gives their absolute location and number, when no calculi are present it saves the risks of an exploratory nephrotomy.—*Journal of the Am. Med. Ass'n.*

Subscription to the AMERICAN X-RAY JOURNAL is invariably in advance. The blue pencil cross-mark indicates delinquency. The small price of one dollar for this journal should not stagger any one.

X-RAY NEGATION LEADS TO POSITIVE DIAGNOSIS.

Sunday, Oct. 29, 1899.

Dear Dr. Robarts:—

After a most careful examination of Mr. W., I have come to the conclusion that the pus in the urine comes primarily from an abscess of the prostate or deep urethra, with secondary infection of the neck of the bladder—and, of course, a general cystitis following. It does not appear to me that the kidney is involved in the pus production for the reasons:

1. The x-ray failed to show (Dr. Robarts) stone in the kidney, the common cause of pyuria of renal origin;

2. Examination of the urine shows (Dr. Close) no trace of pus casts, or of epithelial casts—an almost positive evidence of itself that the pus does not come from the kidney; and

3. Urine passed after careful irrigation of the bladder shows much less debris than that before irrigation—a strong indication that the deposit comes from the deep urethra and bladder, and not from the kidney, or pelvis of the kidney.

I do not wish to declare positively that there is no pyelitis—only gathering the urine as it passes from the ureter could decide this beyond question, but I felt the case to be so clear, without the use of the Harris instrument, that I did not subject the patient to the discomfort of its trial.

So much for the negative evidence.

Of the positive symptoms: Rectal examination shows a prostate quite larger than should be present in a man of his age, with exaggerated tenderness; the passage of a large steel sound causes (a) considerable suffering; (b) the discharge of quite a little pus from the meatus, and (c) a decided showing of blood—which of itself is sufficient to determine the existence of a suppurative area in the prostatic urethra or the prostate itself.

As to treatment, it is possible that a

careful stretching of the prostate (Belfeld's method), followed by parenchymatous injections of a solution of indine-trichloride, 1 to 2000, 10 to 30 minims daily, distributed in various parts of the prostate, with irrigations of the bladder, might cure: it is worthy of trial if operation cannot, or will not, be accepted. The best treatment is open incision and drainage, in bed, curetting of the prostate, and any ulcers near the neck of bladder, etc. I am sure that with perfect drainage and a few irrigations of the bladder a cure of the suppurative, chronic prostatitis and cystitis may be effected.

Very sincerely yours,

EMORY LANPHEAR.

The diagnosis which was finally concluded in this case by Dr. Lanphear well represents the necessity of the use of the x-rays in diseases of the kidneys. This patient has had pathological urine for more than 15 years. He has consulted physicians and surgeons during this time and has taken treatment, but to no avail. Two surgeons of much eminence advised immediate nephrectomy, as stone was believed to be a certain factor in the renal ailment. The x-rays denied this opinion and paved the way for subsequent diagnosis.—Ed.

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HIGH RATE ROENTGEN TUBE.—An illustration with brief description of a slight modification of the tube described in the Digest, Oct. 14.—Lond. *Elec. and Elec. Rev.*, Oct. 6.

ROENTGEN RADIATION.—Hillers.—A series of carefully made experiments on currents traversing Roentgenized gases and the effect of the pressure of the gas on the current.—*Wied. Ann.*, 68, p. 196; abstracted briefly in *Science Abstracts*, Oct.

X-RAYS IN MEDICAL COLLEGES.

We have made the following inquiry of either the secretary or dean of every known medical college in the United States and Canada, furnishing return postage in each instance:

Doctor.................

Will you kindly inform me of the name of the physician connected with your school that does work with the x-rays?

Thanking you for this information,

Yours truly,

On the return stationery was written: **AMERICAN X-RAY JOURNAL.**

Here are the answers:

ALABAMA.

Medical College of Mobile, Mobile.

Dr. Wm. B. Pape is the name of the physician who does work with the x-ray connected with the Med. College of Alabama.

ARKANSAS.

Med. Dep't Ark., Industrial University Little Rock.

Inquiry about apparatus being made.

CALIFORNIA.

Cooper Med. Col., San Francisco.

Dr. Emmet Rexford, Dr. Stanley Stillman.

University of Cal., Med. Dep't San Francisco.

Dr. Phillip Mills Jones, 803 Sutter St. San Francisco.

California Med. Col., San Francisco.

Dr. J. W. Hamilton, Parrote Bldg.

Hahnemann Hospital Col., San Francisco.

Dr. Geo. H. Palmer, 606 Sutter Street.

College of Medicine, Los Angeles.

No answer.

Col. Physicians and Surgeons, San Francisco.

Dr. Geo. Adam, Phelan Bldg., is our Electro-Therapeutic Professor.

CONNECTICUT.

Yale University, New Haven.

Leonard C. Sanford, M. D., 216 Crown St., New Haven.

COLORADO.

The Colorado School of Medicine, Boulder.

Dr. E. H. Robertson does the work with x-ray.

University Denver Medical Department, Denver.

No answer.

Gross Medical College, Denver.

No answer.

Denver Homeopathic Med. Col., Denver.

No answer.

GEORGIA.

Georgia College of Eclectic Medicine and Surgery, Atlanta.

In reply to yours of 2d inst., I will say that we are not doing a great deal in the line you mention. As Professor of Chemistry, I am giving some attention to x-rays.

Atlanta College of Physicians & Surgeons, Atlanta.

Dr. T. P. Hinman, Inman Bldg., Atlanta.

ILLINOIS.

Illinois Med. Col., Chicago, Ill.

Members of the Faculty of the Illinois Medical College who use the x-ray are: Dr. W. C. Sanford, 103 State St.; Dr. J. L. Morris, 103 State St.

College of Physicians and Surgeons, Chicago, Ill.

We have none.

Hahneman Med. Col. & Hospital, Chicago, Ill.

Dr. F. H. Blackmarr, 2811 Cottage Grove Ave.

Chicago Homeopathic Med. Col., Chicago, Ill.

Replying to your inquiry I will say that Dr. C. M. Neiswanger is the electro-therapeutic lecturer at the C. H. M. C.

Chicago Physio-Medical College, Chicago, Ill.

Ottomar Carliczek will probably be our x-ray representative. Schiller Bldg., Chicago, is his address.

Jenner Med. College, Chicago, Ill.

You want the name of Dr. R. V. Wagner, 308 Dearborn St. He is our Professor of Electro-Therapeutics.

Rush Med. Coll., Chicago, Ill.

Dr. Joseph F. Smith, Mgr. X-Ray Laboratory, Presbyterian Hospital.

Northwestern University Med. School, Chicago.

Mr. Fuchs, Schiller Bldg., Chicago.

Northwestern University, Woman Med. School, Chicago.

No answer.

Bennett College of Eclectic Medicine and Surgery, Chicago.

No answer.

Herring College and Hospital (Homeopath), Chicago.

No answer.

Harvey Medical College, Chicago.

No answer.

Nat. Med. Col., Chicago.

No answer.

Dunham Med. Col. (Homeopathic), Chicago.

E. R. McIntyre, M. D., 92 State Street.

Am. Med. Missionary Col., Chicago.

No answer.

Col. of Med. and Surgery, Chicago.

No answer.

IOWA.

Keokuk Med. Col., Keokuk.

Dr. C. E. Ruth.

Homeopathic Dep't State University, Iowa City.

Prof. L. W. Andrews and A. A. Veblen have such work as you refer to, in their charge.

Med. Dep't State University, Iowa City.

Z. G. Andrews, Prof. of Chemistry, and C. H. Bomman Inter., Prof. C. are the only people here.

Med. Dep't Drake University, Des Moines.

Dr. D. W. Smouse.

Col. of Physicians and Surgeons, Keokuk.

No answer.

Sioux City Col. of Med., Sioux City.

No answer.

INDIANA.

Central Col. of Phys. & Surgeons, Indianapolis.

Dr. A. E. Stone has two x-ray machines. Dr. Geo. D. Kahlo has ordered an apparatus, and Dr. J. Rilus Eastman expects to get one very soon.

Physio-Med. Col. of Indianapolis, Indianapolis.
No answer.

The Med. Col. of Indiana, Indianapolis.
No answer.

Fort Wayne College of Medicine, Fort Wayne.
No answer.

Curtis Physio-Med. Institute, Marion,
No answer.

University of Medicine, Indianapolis.
No answer.

KENTUCKY.

Hospital Col. of Med., Louisville.
Dr. A. G. Hendon.

Kentucky School of Med., Louisville.
Dr. Jesse T. Dunn, 628½ Fourth Ave.

University of Louisville, Louisville.
Prof. H. M. Goodman has charge of our x-ray department.

Louisville Med. Col., Louisville.
No answer.

Louisville Nat. Med. Col., Louisville.
No answer.

KANSAS.

The Kansas Med. Col., Topeka.
Drs. W. S. Lindsay, J. C. McClintock, S. G. Stewart, and R. S. Magee.

Col. of Physicians and Surgeons, Kansas City.
No answer.

LOUISIANA.

Tulane University Med. Dep't, New Orleans.
No answer.

New Orleans University Med. Dep't, New Orleans.
No answer.

MASSACHUSETTS.

Boston University School of Med., Boston.
Dr. Winthrop T. Talbot, Dr. Thomas R. Griffith, Mr. Thomas E. Chandler at the school.

Harvard University Med. School, Boston.
All the surgeons and many of the physicians.

Tufts' Col. Medical School, Boston.
Dr. F. F. Strong, 178 Huntington Ave.

College of Physicians and Surgeons, Boston.
No answer.

MAINE.

Medical School of Maine, Brunswick.
On account of Dr. Mitchell's illness, who is dean of the faculty, Professor T. J. Robinson does the x-ray work. Dr. C. C. Hutchinson, the regular Professor in this department, is now in Germany.

Portland School for Med. Instruction, Portland.
No answer.

MISSOURI.

Col. of Physicians and Surgeons, St. Louis.
Dr. Waldo Briggs, 1405 Olive St.

Central Med. Col., St. Joseph.
Dr. J. W. Bell has the only x-ray in the city. Sixth and Francis St.

Ensworth Med. Col., St. Joseph.
Dr. J. W. Bell.

Kansas City Med. Col., Kansas City.
Dr. J. D. Griffith, St. Joseph Hospital.

University Med. Col. of Kansas City.
Dr. J. N. Scott, Ridge Bldg., is the electrician.

Kansas City University College of Homeopathic Med. and Surgery, Kansas City.
Dr. Chas. S. Elliott, Lect. on Nervous Diseases. He now has a book in press on electricity and the x-rays. 1103 Main St.

University of State of Mo., Med. School, Columbia.
Prof. M. L. Lipscomb, Chair of Physics, sometimes works with x-rays. No one regularly.

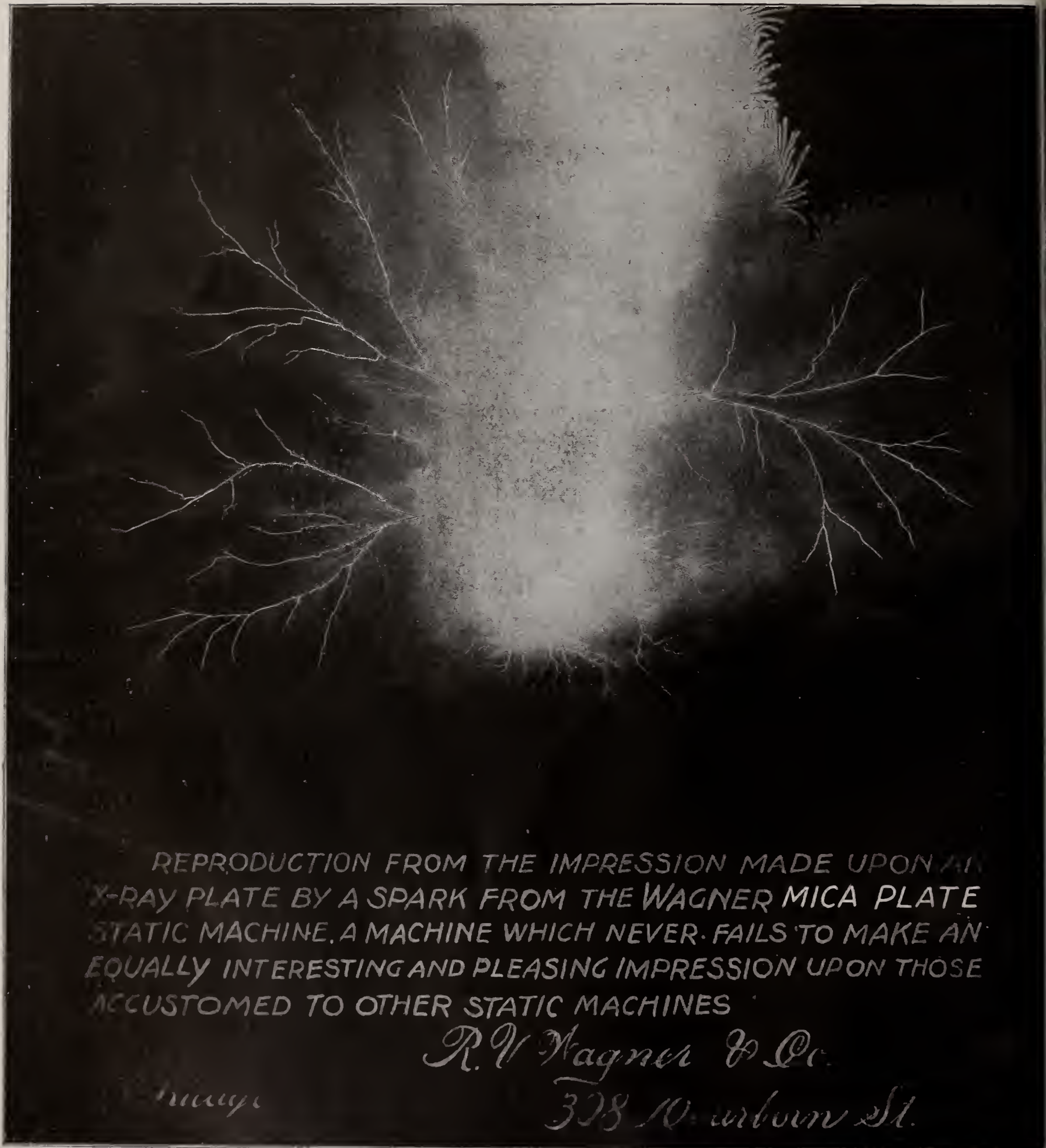
Homeopathic Med. Col. of Mo., St. Louis.
Dr. F. G. Comstock, 3401 Washington Ave.

Am. Med. Col. (Ecl.), St. Louis.
We have no one connected with us who uses the x-ray machine.

Beaumont Hospital Med. Col., St. Louis.
We have not any one who gives attention to x-ray subject.

Barnes' Med. Col., St. Louis.
Dr. Close is referred to.

Missouri Med. Col., St. Louis.
Dr. Von Brokaw.



REPRODUCTION FROM THE IMPRESSION MADE UPON AN X-RAY PLATE BY A SPARK FROM THE WAGNER MICA PLATE STATIC MACHINE. A MACHINE WHICH NEVER FAILS TO MAKE AN EQUALLY INTERESTING AND PLEASING IMPRESSION UPON THOSE ACCUSTOMED TO OTHER STATIC MACHINES

R. V. Wagner & Co.
Chicago 308 Dearborn St.

Mo. Eclectic Med. Col., Kansas City.
Dr. N. J. Carraker, 9th and Walnut.

Med. Dep't Washington University, St. Louis.
No answer.

Marion-Sims Med. Col., St. Louis.
No answer.

Women's Med. Col., Kansas City.
No answer.

Kansas City Homeopathic Med. Col., Kansas City.
No answer.

Medico-Chirurgical Med. Col., Kasas City.
No answer.

MINNESOTA.

Col. of Homeopathic Med. and Surgery, Minneapolis.
There is no one connected with the school that does x-ray work. We have our work done.

The Col. of Med. and Surg. of the University of Minn., Minneapolis.
Dr. Charles L. Green, St. Paul.

Med. Dep't of Hamline University, Minneapolis.
No answer.

MARYLAND.

Col. of Physicians and Surgeons, Baltimore.
Dr. Alexius McGlannan, 313 N. Green St.

Maryland School of Medicine, Baltimore.
Dr. St. Clair Spruill, Lambert and Green Sts.

Med. Dep't of John Hopkins University, Baltimore.
No answer.

Southern Homeopathic Med. Col. and Hospital, Baltimore.
I do all the x-ray work of above institution. I sent you a copy of Am. Med. Mo. containing sample of work. Very truly yours,
Henry Chandlee, Dean.

Women's Medical Col., Baltimore.
The surgeons use the apparatus. Dr. John G. Jay, 869 Park Ave., bought the machine and uses it.

Baltimore Med. Col., Baltimore.
X-ray work in this school is done chiefly by our two surgeons, Prof. R. W. Johnson, M. B., and Prof. Jno. D. Blake, M. D.

MICHIGAN.

Detroit College of Med., Detroit.
Dr. Campbell, 65 Washington Av.

University of Michigan, Ann Arbor.
Dr. Wm. J. Herdman.

Grand Rapids Med. Col., Grand Rapids.
Answer not definite.

Michigan Col. of Med. and Surgery, Detroit.
No answer.

Saginaw Valley Med. Col., Saginaw.
No answer.

University of Michigan Homeopathic Med. Col., Ann Arbor.
Prof. Benj. F. Bailey.

NEW YORK.

Albany Medical Col., Albany.
X-ray specialist is N. Wm. Hailes, 197 Hamilton St.

Women's Med. Col., New York City.
The Women's Med. Col. of the W. S. Infirmary has ceased to exist.

Niagara University Med. Dept., Buffalo.
The Med. Department of Niagara University has for over a year been a part of University of Buffalo, to whose secretary you may look for answer required.

Ecletic Med. Col., New York City.
Dr. H. E. Waite.

New York Homeopathic Med. Col., New York City.
Dr. W. H. King, 64 W. 51st St., does x-ray work.

New York Med. Col. and Hospital for Women, New York City.
Dr. William King, Electro-Therapeutist.

Long Island Col. Hospital, Brooklyn.
Prof. J. S. Wright, 30 Lehenneshor St.

Cornell University Med. Col., New York City.
Dr. F. W. Gwyer, 130 East 38th St. does most of the work in the college as regards x-rays.

College of Physicians and Surgeons, New York City.
Dr. E. Leaming is an official photographer for this college and his laboratory here in the building. Dr. R. H. Cunningham does x-ray work also.

Bellevue Hospital Med. Col., New York City.

I have 16 plates, 30 inches each, static machine. I am professor of operative and clinical surgery, Cornell University Med. Col., and visiting surgeon to Bellevue Hospital, and do x-ray work of both institutions. Yours truly,

Dr. F. W. Gwyer.

University and Bellevue Med. Col., New York City.

Prof. J. D. Bryant, M. D.

Buffalo Med. Dep't of University, Buffalo.

We do not use the x-rays.

Syracuse University Col. of Med., Syracuse, N. Y.

Dr. A. Clifford Mercer.

NEW HAMPSHIRE.

Dartmouth Med. Col., Hanover.

Dr. G. D. Frost.

NEBRASKA.

J. A. Creighton Med. Col., Omaha.

Prof. Chas. Cromley, Chemist, manipulates the x-ray machine.

Lincoln Med. Col. of Cotner University (Ecl.), Lincoln.

Dr. Arthur Carr, 1205 O St.

Omaha Med. Col., Omaha, Nebr.

Dr. J. E. Summers, Jr., McTague Block.

NORTH CAROLINA.

North Carolina Med. Col., Davidson.

Dr. Henry Louis Smith is our Professor of Physics and Medical Electricity. He makes use of x-rays frequently.

OREGON.

Willamette University, Med. Dep't, Salem.

We have no x-ray machine in the school.

University of the State of Oregon, Portland.

No answer.

OHIO.

Cleveland Hospital Med. Col., Cleveland.

Dr. Eber W. Gurley, 176 Euclid Ave.

Pulte Med. Col., Cincinnati.

Dr. H. H. Wiggers, 529 Everett Street.

Stearling Med. Col., Columbus.

Dr. L. M. Early, E. Long St.

Laura Women's Med. Col., Cincinnati.

Wm. Taylor, 553 W. 7th St.

Eclectic Med. Institute, Cincinnati.

Dr. John R. Spencer, 952 W. 8th Street.

College of Medicine, Lebanon.

This school has not installed an x-ray plant as yet. Its course of study covers the Freshman and Sophomore studies in medicine only.

Ohio Medical University, Columbus.

Catalogue under cover by this mail. (They use x-rays.—Ed.)

Cincinnati Col. of Med. and Surgery, Cincinnati.

Dr. S. P. Kramer, 22 W. 7th St.

Medical Col. of Ohio, Cincinnati.

Dr. W. H. Crane, 20 W. 9th St. is our Professor of Med. Chemistry and has charge of our x-ray apparatus.

Miami Med. Col., Cincinnati.

Mr. W. J. Taylor, 553 W. 7th St.

Cleveland Med. Col., Cleveland.

Answer not legible.

Toledo Med. Col., Toledo.

Wm. A. Dickey, M. D., 2121 12th Street.

Cleveland Col. of Physicians and Surgeons, Cleveland.

No answer.

Cleveland Homeopathic Med. Col., Cleveland.

No answer.

Hygeia Med. Col., Cincinnati.

No answer.

PENNSYLVANIA.

Jefferson Med. Col., Philadelphia.

The undersigned operates x-ray apparatus in Jefferson Med. Col. Hospital. Yours truly,

L. H. Prince.

Medico-Chirurgical Col., Philadelphia.

Dr. M. K. Kassabian, Medico-Chirurgical Hospital, Cherry St., bet. 17th and 18th.

Western Penn. Med. Col., Pittsburg.

No answer.

University of Pennsylvania, Philadelphia.

Dr. Goodspeed, Dr. Leonard.

Hahnemann Med. Col., Philadelphia.

No answer.

Women's Med. Col., Philadelphia.

No answer.

SOUTH CAROLINA.

Med. Col. of the State of South Carolina, Charleston.

Dr. Manning Simons, Prof. of Surgery, and others use the x-rays.

TEXAS.

Med. Dep't University Texas, Galveston.

Dr. Seth M. Morris, Prof. of Chemistry, does most of x-ray work with us. Dr. J. E. Thompson, Professor of Surgery, has recently taken it up personally.

Med. Dep't Fort Worth University, Fort Worth.

No answer.

TENNESSEE.

Med. Dep't University Tenn., Nashville.

Our apparatus has not yet come. When we receive it Dr. Hayden A. West will be in charge.

Meharry Med. Col., Nashville.

Dr. G. W. Hubbard writes: I do all of the work that is done with x-rays at this college.

Chattanooga Med. Col., Chattanooga.

I have official supervision of the operation of our x-ray instrument. Yours,

E. A. Cobleigh, Dean.

University of Nashville, Nashville.

Dr. S. S. Briggs.

Vanderbuilt University, Nashville.

No answer.

Tennessee Med. Col., Knoxville.

No answer.

Memphis Hospital Med. Col., Memphis.

No answer.

Sewanee Med. Col., Sewanee.

No answer.

Med. Dept. of Knoxville Col., Knoxville.

No answer.

VIRGINIA.

Med. Col. of Virginia, Richmond.

Wm. H. Taylor, M. D., 610 E. Grace St.

University Virginia Med. Dep't, Charlottesville.

Dr. J. Humphreys does work with the x-rays.

University Col. of Med., Richmond.

Dr. Stuart McGuire, 513 E. Grace St., is the only physician connected with the University Col. of Med. that uses x-rays.

VERMONT.

University Vermont Med. Dep't, Burlington.

There is no one who makes a specialty with the Med. Dep't. There is some work (very little) done by the hospital staff.

WASHINGTON, D. C.

Howard University.

Prof. J. W. Lamb, 906 9th St., has given some attention to x-rays.

Medical Dep't Columbia University.

Dr. P. R. Stone, 1345 F St. N. W.

University of Georgetown Med. Dep't.

Prof. S. T. Vaughan, 816 17th St. N. W.

National University.

No answer.

WISCONSIN.

Milwaukee Med. Col., Milwaukee.

We have our work done outside.

University of Wisconsin, Madison.

Dr. B. W. Snow.

Wisconsin Col. of Physicians and Surgeons, Milwaukee.

No answer.

CANADA.

University of Bishops Col., Montreal, Ont.

In reply to yours of 4th inst., I beg to say that Dr. Robert Wilson, 596 Wellington St., our Professor of Materia Medica, does the x-ray work for our faculty.

Faculty of Medicine of Queen's University and Royal Col. of Physicians and Surgeons, Kingston, Ont.

Reference is made to Dr. Third, resident surgeon Kingston Gen'l Hospital.

McGill University Med. Dep't, Montreal, Ont.

Dr. G. P. Girdwood, Prof. of Chemistry and Physician and Surgeon-in-Chief to the Canadian Pacific R. R.

Toronto University Med. Faculty, Toronto.

No answer.

Trinity Med. Col., Toronto.

No answer.

Western University Med. Dep't, London.

No answer.

Ontario Med. Col. for Women, Toronto.

No answer.

Ecole de Med. et de Chirurgie, Montreal.

No answer.

NOVA SCOTIA.

Halifax Med. Col., Halifax.

No answer.

Salhousie University Med. Faculty, Halifax.

No answer.

MANITOBA.

Manitoba Med. Col., Winnipeg.

No answer.

Roentgen Ray in Incipient Tuberculosis.

Wiliams reports the results of examinations of 165 patients with incipient tuberculosis, by the Roentgen ray. The diagnosis of tuberculosis was confirmed by the discovery of the bacillus or the reaction of the tuberculin test. He groups his patients into two classes, those with slight physical signs but no rales, and those without physical signs. He reports cases of each. He thinks that the value of the Roentgen test is that it gives an early warning when other signs are not prominent, and in some cases it may correct a mistaken diagnosis of tuberculosis from apparent physical signs. It is also of value in cases of tuberculosis with pleurisy and effusion, with bronchitis and emphysema. In two cases the x-ray failed, though the other tests demonstrated the disease, but generally it is the most efficient means of diagnosis. The fluorescent screen is more reliable and convenient than photographs in these examinations.—*Journal Am. Med. Ass'n.*

Synergetic Medication.

"Antikamnia Laxative Tablets" or "Antikamnia & Quinine Laxative Tablets,"—as the condition presented may require,—will compel the excretory organs to perform their natural functions naturally, without griping or stomach sickness, and they are, therefore, the proper remedies for constipation, headaches, chills and fever, malaria, la grippe and allied conditions, coryza, colds, congestions and the general disturbances arising from suppressed action of the various functions of secretion and excretion.

These two new combinations are particularly useful in that torpid condition of the bodily functions, produced by the retention of poisonous ptomaines, scientifically known as autotoxia.

We would especially call attention to the wide use of "Antikamnia & Quinine Laxative Tablets" in chronic or semichronic diseases which begin with a severe "cold." Their power to relieve pain, reduce fever, tone up the system, and restore natural activity to the bowels, will, we feel sure, make these tablets unusually valuable.

We believe the profession will at once appreciate the uniqueness and usefulness of these combinations.—*The Atlanta Journal-Record of Medicine.*

Mind Reading.

Telepathy is one of the new arts, and men of science are to-day deeply interested in its possibilities. Our readers will find a free offer in our advertising pages this month of a course in Mind-Reading by the Psychic Research Company of Chicago. As it costs nothing to investigate this offer, and the Company is an incorporated, reliable concern, with a good reputation for painstaking research, we think this a fine opportunity for our readers to glean some facts of value. The guarantee of money back if not satisfied is a feature of the Psychic Research Company's business that inspires confidence. We believe that very many of our readers will accept this offer, and we request that in writing to the Research Company our readers mention that the advertisement was seen in our pages.

THE AMERICAN
X-RAY JOURNAL.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

PUBLISHED MONTHLY BY THE AMERICAN X-RAY PUBLISHING COMPANY.

HEBER ROBARTS. M. D., M. E., Editor.

New York City Business Office, 100 William St., Room 205. Prof. T. L. Brophy, Representative.
Chicago Business Office, 87-89 Washington Street, Room 514. Dr. Fred W. Spink, Representative.

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JOHN TOWNSEND PITKIN, M. D.

The American X-Ray Journal.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

VOL. 6. ST. LOUIS, JANUARY, 1899. NO. 1.

X-RAY LIGHT TUBE.

We illustrate here two of the x-light tubes made by Messrs. Oelling and Heinze. We can best describe these by first mentioning some of the observations Dr. Rollins has made in connection with x-light, in accordance with which he has designed these tubes. He has shown that for practical purposes x-light is a hydrogen phenomenon, the light originating in this way: The cathode is a storehouse of hydrogen, the particles of which under the electric stress are repelled by its concave surface, because, as shown by Crookes, they have charges of like sign. These particles, traveling with high velocity toward the anode, are attracted by it because their charges are of opposite sign, and striking suddenly have their temperature raised to a very high degree. As a result they vibrate, throwing the ether into waves unlike those of ordinary light, because of greater frequency and shorter trains, which quickly diminish both in amplitude and frequency, for the particles lose heat rapidly, on account of their small size. As the velocity depends not only upon the degree of repulsion between the particles and the cathode, but also upon the attraction of the anode, it is evident that the target on which they strike should be an anode, otherwise the efficiency of the tube is less.

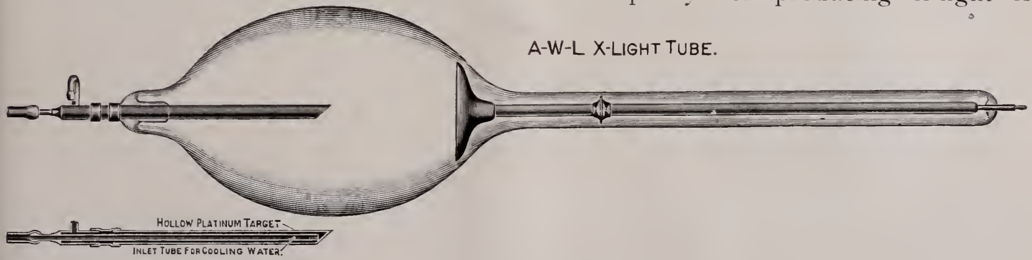
A-W-L X-LIGHT TUBE.

FIG. 1.—SCALE ¼.

After a tube has been used for a while its efficiency diminishes. The vacuum may be lowered by the usual potash regulator or other similar device, but the capacity for producing x-light is only temporarily restored, for water vapor cannot take the place of hydrogen which has been used up. To overcome this difficulty the experimenter named invented the intermolecular regulator, which allows hydrogen to be introduced from the outside through metal tubing forming part of the walls.

The definition of a tube depends upon the impact area on the target being as small as possible. To produce this result the target must not be placed at the centre of curvature of the cathode, as directed by previous experimenters, but always beyond this, as was first done by Frei. Dr. Rollins has shown that the distance varies with the charge on the particles—the greater their mutual repulsion, the further the focus will be from the cathode. When the force of a powerful generator is concentrated on a small area of the target, this is quickly melted. To avoid this he has made the target hollow and cooled it. A more detailed account of x-light phenomena may be found in a series of notes by him in the *Electrical Review* during the last two years and in his papers in this journal.

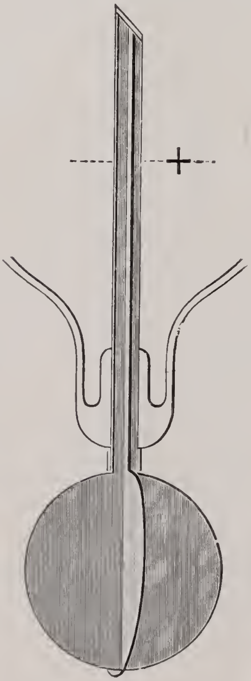

FIG. 2.—COPPER VANE FOR COOLING TARGET OF A-W-L TUBE.

Fig. 1 represents on a scale of one-fourth the original A-W-L-tube which Mr. Oelling has made in its present form for over two years. The target is a hollow tube of seamless platinum drawn by Baker & Co. For moderate generators it is sufficient to cool the target with the copper vanes shown in Fig. 2. For more powerful ones a rotary air compressor is furnished. For the most powerful apparatus it is necessary to cool the target by discharging a stream of water against the back of it, the waste escaping through the outer tube to any convenient receptacle. Trowbridge, Tesla, Edison and Williams cooled the discharge tube soon after Roentgen discovered that some of Lenard's rays would penetrate the human body, but this was the first tube in which a hollow target was cooled to prevent it from melting, and though it has been copied by Europeans, the copies are less efficient and inferior in design.

Vacuum Regulators: These are placed in various positions to suit customers. In the figure of the A-W-L-tube the regulator is made to support the stem of the cathode. This is its most symmetrical position and the one recommended by the designer of the tube, but it exposes it to some risk of injury. It may be placed on the side of the tube instead of the usual water vapor potash regulator.

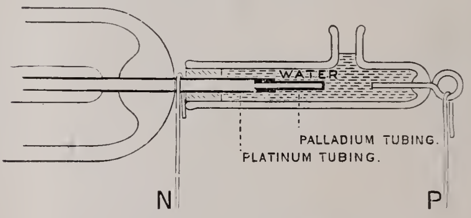

FIG. 3.—A-W-L FEEDER.

It consists of a short piece of platinum tubing, one end being sealed into the glass. The other is closed by a piece of palladium wire drilled out, leaving one end solid, the other being soldered into the platinum tube. When the vacuum is too high this tube is placed in the feeder shown in Fig. 3, which is filled with water. The wires p and n are connected with the street current through two sixteen-candle power lamps, or, if this is not available, with a series of dry cells in a convenient and portable box. When the palladium is made negative, the hydrogen goes into the tube and lowers the vacuum. The method of supporting the terminals in these tubes deserves mention. After showing that the usual glass wrappings were not only useless but undesirable, tubes were constructed with strong terminals of aluminum three-sixteenths of an inch in diameter, which were held in place by disks of mica and lava as shown in the figures and in detail in Figs. 4 and 5.

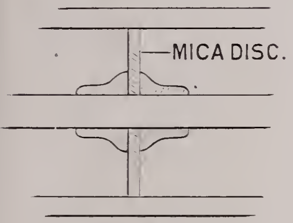

FIG. 4.

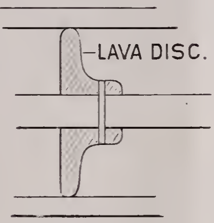

FIG. 5.

The tube shown in Figs. 6 and 7 is of the rotary target type and is the most popular and generally useful tube of the present day, for the cooled target tube is seldom needed except by a few who have very powerful generators. When a hole has been melted in the target, a slight jar will bring a fresh surface into position to receive the cathode discharge. In this form the regulator is a piece of platinum tubing sealed into the glass. Hydrogen is introduced by heating the end of the tube in a very small hydrogen flame, taking care that the gas before it is burnt comes in contact with the metal, which is to be kept red-hot by the other part of the flame.

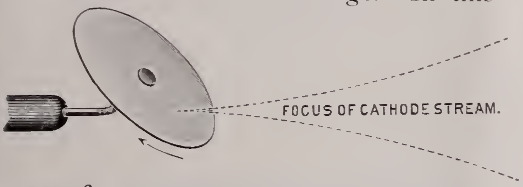

FIG. 6.—FULL SIZE BOTARY TARGET OF A-W L TUBE.

These tubes have come into extensive use in many large hospitals and have been used entirely by Dr. F. H. Williams in his classic work on the soft tissues, particularly those of the heart and lungs. They have been used for more than two years at the Boston City Hospital, where the amount of x-light work exceeds that of any other hospital in the world, the first observations on the heart and lungs having been made here almost immediately after Roentgen's discovery was announced.

The tubes have a certain air of distinction and are powerful, durable and graceful. Messrs. Oelling and Heinze deserve the thanks of the medical profession for having spent time and money in making them available.

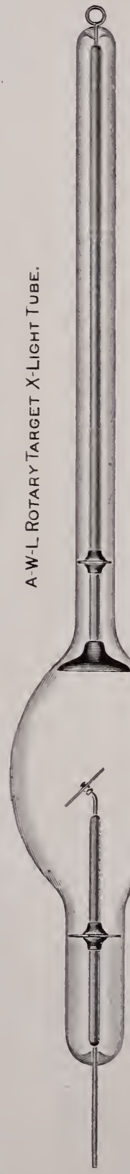

FIG. 7.—CSALE ¼.

A-W-L ROTARY TARGET X-LIGHT TUBE.

EXCITATION OF THE CROOKES' TUBE BY THE STATIC MACHINE.

BY JOHN T. PITKIN, M. D.

Chapter XI.

In the study of the evolution of electrology we learn that the primitive form of the dynamo is found in the static machine, e. g., the field magnets of the former are the analogue of the stationary plates of the latter, the armature corresponds to the revolving disks, the commutator is represented by the neutralizing rods, etc., etc.

The electrical laws governing the placing of dynamos or batteries in series, or winding the armature coils in the same manner, for tension, or in multiple for quantity, also maintain in the similar arrangement of their prototype as a whole, or the relation of its integral portions to each other. "The electro-motive force from any electrical machine at any moment of time will depend upon the rapidity with which the armature cuts the lines of force of the fields."

Static machines containing large revolving disks, or those driven at great speed, develop currents of high voltage, while the multiplication of plates gives volume to the flow. A machine having twelve thirty-inch revolving wheels, under moderate momentum, will excite the largest Crookes' tube sufficiently for ordinary work, but there are cases, where the patient is of extra weight or unusual muscular development, where even the twelve-plate machine will be found lacking; its electrical output is inadequate. Under these unfavorable circumstances it has been our practice to couple up two static machines in simple multiple relation to each other. This we accomplish in the following manner: On the posterior aspect of the old machine we place two new prime conductors through the woodwork and attach them to the combholders just as they are always connected in front. We place heavily insulated wires between the prime conductors of the new instrument and the posterior arms of the old apparatus, start both machines, so that their polarity will be the same, and allow them to operate in unison, so arranged they deliver us a spark fat enough for the fattest patient's picture. It has recently been our custom in photographing difficult cases to thus operate a twelve and an eight-plate instrument in this simple harmonic relation to each other; the spark so generated has considerable thickness and gives a loud, high-pitched note, similar in tone to the discharge from a large pair of Leyden jars. The Crookes' tube in series has a very light green color throughout its interior; the target becomes red-hot, but will not fuse, and the body of the largest patient is highly illuminated. Allowing for the electrical loss between the static machines as arranged above (which is considerable) we conclude that the apparatus for the expert operator and hospital work of 1900 should have at least sixteen thirty-inch revolving plates and that in order to control its heavy electrical discharge its construction, with improved and entirely revolutionized insulation as its most important feature, becomes an absolute necessity. (See subsequent chapter.)

Here the static apparatus reaches its present limitations as a Crookes' tube exciter and must rest upon its laurels until such a time as the makers of tubes shall supply us with larger and better bulbs, and there is every reason to ask and expect from them tubes which can be employed to photograph the bones of the hip, thigh and spine, and the heart and liver, just as distinctly as the x-ray toys of three years ago skiagraphed the bones of the hands and wrist. The high tension induction coils will soon fall into disuse because their currents, being pulsatory in character, reversing either completely or incompletely in polarity with each beat, strain and overheat the tubes; the energy employed in making this change becomes manifest, as heat bending or fusing the electrodes or the target, it is therefore not only disruptive in character, but also in its effects. The electrical flow from the static machine, on the other hand, when carefully constructed, is even, steady, unidirectional, and the tube will last for years without perforation or fusing under its uniform excitation. The skiagraphs are more distinct because a tube yielding a uniform light will not efface its own impression from the sensitive plate as sometimes happens when the x-ray light is very irregular.

BUFFALO, N. Y.

The Elmer Gates Laboruatory of Psychology and Psychorgy.

CHEVY CHASE, MD., Dec. 6, 1899.

THE AMERICAN X-RAY JOURNAL,
310 Chemical Building,
St. Louis, Mo.

Dear Editor:—In your December number of THE AMERICAN X-RAY JOURNAL is a paragraph, stating that Dr. Wagner was the first to get the impression of a spark by placing the sensitized plate between the sliding electrodes of a static machine, and before I wrote my article which appeared in *The Cosmopolitan*. I first made my experiments on August 6, of the present year, and showed them to a number of gentlemen, and they were sent to Dr. C. H. Bowen, of Providence, R. I., who showed them to scientific men in Boston, and my experiments were first published in August. I enclose a print of the first one made. The prints or electrographs were here on exhibition since August 6.

Yours truly,
ELMER GATES.

[The print of the first electrograph mentioned in Prof. Gates note is certainly a most beautiful phenomenon of an electric spark. The electrograph reached us too late to obtain an electro for use in this issue.—ED.]

A FLUORESCENT LEAD.

Some Observations in Radiography.

By DR. ALEX. L. HODGDON, Professor of Nervous Diseases and Diseases of the Mind, Maryland Medical College, Neurologist to the Home for the Aged, Baltimore.

It is not my intention, in this article, to enter into an exhaustive discourse as to Roentgen radiancy, but principally to call your attention to some phenomena which have proven of great interest to me, and which I hope may to some extent prove interesting to others.

Having done considerable radiography for various physicians, this case has presented itself, among others, and came to me from Dr. Funck, who desired to locate, if possible, what he diagnosed as a shot in the orbit of the eye, and whose diagnosis, I understand, has since been confirmed by the removal of the eye, and the finding of two shot.

The subject of this narrative, a man about forty years of age, while hunting with his father when a boy, accidentally received the contents of the gun, the charge of number five shot striking him in his head, all of which were supposed to have been removed, with the exception of one or two, which had penetrated the eye, the shot having struck him at a slant. Placing him in a chair, I turned on the Roentgen lamp and drove the rays in an almost transverse direction through the skull, giving the Hammer Extra Fast plate an exposure of about eighteen minutes, after which, having retired to my dark room with the plate, I placed it in the developer, and proceeded to rock as usual. As I continued to sway the tray containing the developer and plate, peculiar dark, and what seemed to be irregular spots shot out upon the plate, causing me to fear that it had been light-struck, but upon closer inspection, some time after the plate had dried, I could arrive at no other conclusion but that the spots, which showed themselves positive instead of negative on the plate, were produced by the shot, which through some means or other had become fluorescent.

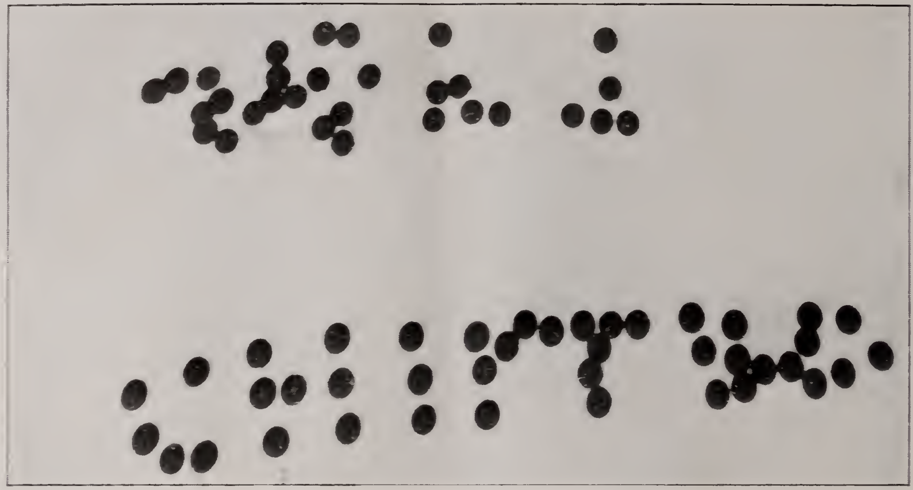

FIG. 1.—NO. 5 CHILLED AND NO. 5 SOFT SHOT.

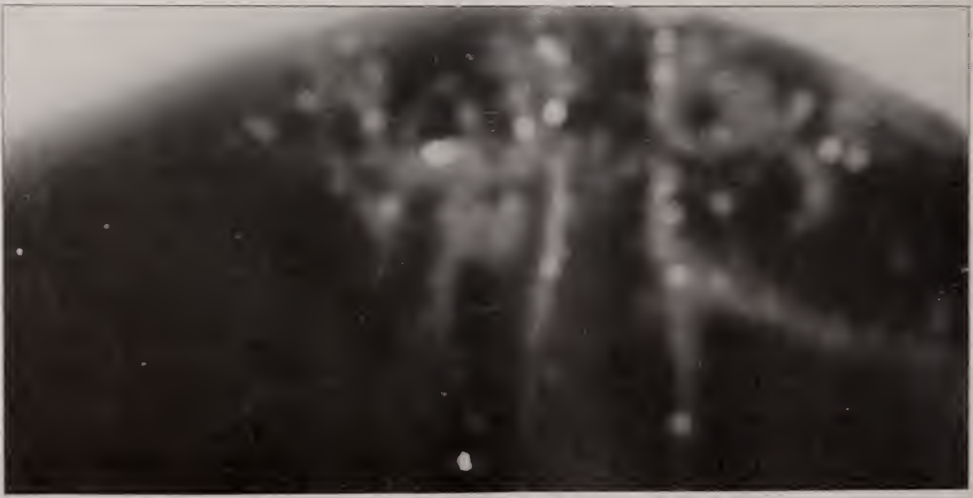

FIG. 2.—NO. 5 SHOT IN HEAD.

Radiography being a comparatively new science, any investigator must expect at any moment to be confronted by some new conditions associated with this very wonderful form of light, so in so far as my knowledge was concerned, never having heard of any instance of fluorescent lead having been reported, yet having obtained something entirely different from all former investigators, I could not rest without trying to find out what gave rise to such results.

As we all know, pure lead is nearly opaque to the rays, as can be seen by glancing at the radiograph of bullets of pure lead.

The rays have penetrated, to a certain

extent, their periphery, but very little through their centres; consequently moulded shot, if any should be made would retard the action of the light, would come out white or clear on the plate and dark in the print or finished radiograph, as compared to the lighter detail of the bone. In this picture of the head will be noticed that the very opposite condition has occurred, and the question resolves itself into this: What is the cause of not only the shot failing to appear darker than the bone, but the bone appearing darker than the shot; the latter standing out in distinct white globules in the print, indicating that at these points the rays passed through the head to become apparent upon the plate with greater ease and less resistance than at any other point?

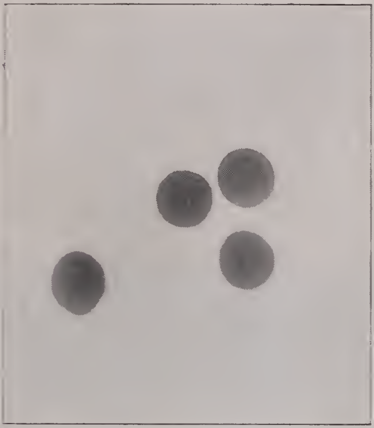

FIG. 3.—RADIOGRAPH OF PURE LEAD BALLS.

The answer in my mind resolved itself into this: That either there must have been a uniform necrosis of the bone at various points, of the size of number five shot (in that way decreasing the resistance to the rays), or that some of the shot before or after entering the system had become fluorescent. I chose the latter theory, the reasons for which I will now set forth, and will try to prove *that shot is fluorescent.*

The first step in the research is to exclude the possibility of necrosis. Who has ever heard of a uniform necrosis of the skull, each necrotic point appearing the size of a number five shot? Furthermore, there can be seen in the picture shot overlapping and, in one instance, at least, at the point where they overlap I noticed increased radiance which appears as a whiter area on the print, while if the substance were not fluorescent, the increased thickness would have produced greater darkness of detail. That these objects are number five shot, it seems to me, no one knowing the size of this class of shot would doubt, and to compare them more accurately it is only necessary to examine the radiograph of the number five chilled and soft shot taken upon a four by five plate; these chilled and soft shot, as will be noticed, are themselves distinctly fluorescent, many of them more so, and in different degrees from others; one, at least, of them spirting out beautifully, largely uniform in all directions, whilst others fluoresce hemispherically or crescentically, but none of them present the distinctly globular appearance of the shot which are found in the head.

FIG. 4.—DIAGNOSIS BY EXCLUSION OF "LUMINERE VOIRE"—GUSTAVE LE BON.

How are we to arrive at a conclusion as to why shot fluoresce and pure lead does not, and explain the difference in the fluorescence of individual shot? In the first place, the bullets are pure lead, while the chilled shot contain antimony and arsenic, the soft shot only arsenic mixed with lead. Antimony, under certain conditions, is placed by Morton on the list of fluorescent substances, but arsenic he does not mention, and as can be seen from my radiograph of arsenious acid, that it is not fluorescent, yet both the shot which contain the arsenic, and those which contain the arsenic and antimony are distinctly fluorescent. Consequently I have formed the belief that a combination of arsenic and lead is distinctly fluorescent, and the difference in the proportion of the two metals when combined creates the difference in the phenomena of fluorescence. It may be possible that the combination of lead and arsenic in varying proportions may have the power of assimilating, and then separating the various forms of rays, which may take place within the high vacuum tube, and the perfectly circular luminescence which is noticeable in the shot in the head, and which does not extend beyond the normal periphery of the shot, may be due to certain invisible anodal rays, and may not, like the Roentgen rays, be of cathodal origin, but these rays may be waves of light directly circular in their movements, whilst the hemispherical luminescence of the shot, which has been radiographed by itself, may be invisible pulsations in the ether of anodal origin.

The direct spirting fluorescence of the shot, noticeable where they have been radiographed by themselves, is probably due directly to the Roentgen rays, the child of the cathode rays, whose electrified atoms, or ions, have been filtered out, leaving merely the Roentgen rays. Roentgen rays are supposed not to show any perceptible refraction, or regular reflection, or polarization. Roentgen suggested that Roentgen light might consist of longitudinal vibrations; others have suggested ether streams, ether vortices or even streams of minute corpuscles. Thompson says:

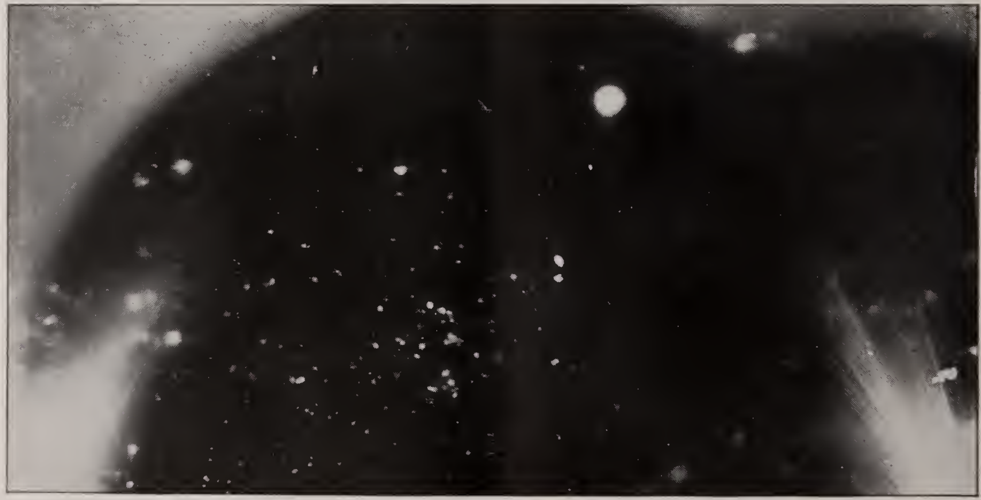

FIG. 5.—LIGHT STRUCK PLATE.

*"Invisible waves may have wave lengths that are longer than that of the red waves, or smaller than that of the violet waves."

Dr. Fomm, who has measured the wave length of the rays by interference methods, finds it about 1-15, the smallest wave of ultra violet light yet recorded. Many experimenters consider the rays non-homogeneous, but a mixture of several different kinds of rays.

In conversing with a gentleman who

for a number of years has been connected with the manufacture of shot, I was informed that a certain huntsman always manifested a desire to procure shot from a well-known firm, for the reason, he said, that it contained so much arsenic that it preserved the game. It must be remembered that this man, whose head has been radiographed, was shot long before the advent of the chilled shot, which precludes the possibility of antimony having been present, and shows that the shot were composed of arsenic and lead. That these shot-shaped spots are not due to human rays (which have been described by one investigator) goes without saying; that they are not due to the Becquerell rays may be demonstrated by the absence of uranium compounds; that they are not due to the Skodowska rays is made plain by the absence of thorium and its compounds; that they are not due to Monsieur Gustave Le Bons Luminere Noire I have demonstrated by small blank photograph taken from plate exposed to shot, the shot having been exposed to light, and the plate developed in the usual manner, but upon which no shadows of shot can be seen.

That these shot which appear fluorescent are really shot, can it would appear, be quite clearly proven by accurate measurements of same, when compared to those radiographed by themselves. That the plate was not light-struck, can be demonstrated by a photograph of a light-struck plate. The first plate, giving skiagraph of head, was developed in Pyro; all of the other plates and Velox paper I developed in Rodinal, which I prefer to all other developers, as it is good, cleanly and convenient. I have radiographed a number of metals, iodide, oxide and carbonate of lead, and arsenious acid, looking for fluorescence, but found none, excepting in the shot. I thought possibly some chemical transformation might have taken place through some change in the shot while in the body, but none of these fluoresced with the exception of the shot.

The Albion, Cor. Cathedral and Read Street.

**Light visible and invisible. Thompson Annual Cyclopoed.*

THE ROENTGEN RAYS IN MILITARY SURGERY.

Surgical Radiographer to the General Hospital, Birmingham.

BY JOHN HALL-EDWARDS, L. R. C. P., F. R. P. S.,

From the report published in the *British Medical Journal* of November 4th of the arrangements made by the War Office for the transportation of Roentgen ray apparatus to the seat of war, it would appear that this adjunct to military surgery is not receiving the amount of attention which its importance warrants. Of the ten sets of apparatus provided, four only have reached South Africa, whilst two of these are located so far away from the field of operations that they must be of little service. The remaining six sets, we are told, are either on their way out, or are about to be dispatched.

It is freely acknowledged that no medical equipment for active military service can be considered complete unless an x-ray apparatus is included; it must therefore follow that, in many instances, our wounded are not having the best possible done for them. Up to the present time some 750 men have been wounded, and as it is fair to assume that in at least 80 per cent of the cases the x-rays must have proved of service, the two apparatuses in Natal must have been kept exceedingly busy, or, as is much more probable, they cannot have been used in half the cases in which they were necessary.

It has been proved beyond the shadow of a doubt that the application of the x-rays to military surgery constitutes one of the greatest advances of the century. Mr. Mansell Moullin, F. R. C. S., in his presidential address to the Roentgen Society, in July last, said:

"The benefit which surgery has derived from the improvements which have been effected in the use of the Roentgen rays during the past year is no less striking. Military surgery will have to be rewritten. Thanks to the ease with which suitably planned apparatus can be carried on campaign; all the wearisome and intensely painful probings after bullets and foreign bodies, to which the wounded look forward with such dread, have been swept away."

As one of the first in this country to apply the Roentgen rays to practical surgery, and as a constant worker both in hospital and private practice since, I have no hesitation in echoing the statement above quoted. It may be argued that inasmuch as in modern warfare few bullets find their billets in the bodies of the wounded, the x-rays must prove of little practical use. This is, however, incorrect, for in every case in which a bone has been injured the amount of injury can be ascertained, and the subsequent treatment arranged accordingly.

The great drawback to successful surgery in the field is the difficulty of carrying out the principles of absolute cleanliness, upon which modern surgery is founded. That at certain times and in certain places absolute cleanliness is impossible I freely admit, and knowing this it becomes all the more necessary that every possible step in the direction of securing the desired end should be seized upon. With the x-rays at command an injured limb can be examined and the injury diagnosed, the presence, shape, and exact location of a foreign body ascertained, and the amount of injury to a bone discovered, without giving the patient pain and without removing the dressings. The probe is rendered unnecessary, and dangerous manipulation can be dispensed with. In many cases all can be done with a small apparatus at a field hospital, or even at dressing station, whilst in others the larger apparatus at the base can be brought into requisition.

After the recent Nile campaign much dissatisfaction was expressed, both in Parliament and elsewhere, because the ambulance arrangements were imperfect, and the x-rays had not been fully utilized. The Under-Secretary for War said "that there had been no case of a wounded man at the Atbara to whom the absence of the Roentgen apparatus had made any difference." That this statement was not an explanation must be patent, as the results of the application of the x-rays could in no case be foreseen. The excuse offered by the War Office was that the transport difficulties had not been overcome. Since this time the necessary apparatus has been much simplified and improved, whilst Major Beevor, myself, and others, have demonstrated that the transport difficulties are more imaginary than real.

With an apparatus I have devised I have given two demonstrations in the field in conjunction with Surgeon-Major Freer and the ambulance section of the First Volunteer Battalion Royal Warwickshire Regiment. In each instance three negatives were produced, and developed under the conditions of actual war. The apparatus (including portable 8-in. spark coil, accumulators, developing tent and stand, and box for tubes, plates, and chemicals sufficient for 100 exposures) was carried to the field in the ambulance wagon, and although it was freely jolted for a distance of six miles it worked to perfection.

Such an apparatus can easily be carried (should necessity arise) for a long march by eight men, and although small it is quite sufficient for field work; more elaborate and larger apparatus can be supplied to the hospitals. The chief difficulty previously experienced in applying the x-rays lies in the changing of the accumulators; this has, however, been successfully overcome, and in the present war, where the line of operations will in all probability follow the railway, there should be no difficulty in this respect.

The fluorescent screen is of very little use in the field, owing, on the one hand, to a darkened room being necessary, and on the other to the fact that the surgeon in command of the x-ray apparatus is rarely the one who is entrusted with the subsequent operation. A negative or series of negatives is much more useful, as they can be placed in the hands of the operating surgeon, who can refer to them at any stage of the operation.

Even when the apparatus is working to perfection, the surgeon in whose hands it is placed must have a knowledge of photographic procedure, or his results will be useless, and in the event of anything going wrong the operator must have had considerable previous experience, in addition to a fair knowledge of electricity. I know not whether those sent out with the sets above mentioned have the requisite training to carry out their mission with success, but if they have not I can confidently predict that their efforts will to a great extent fail. If military surgery is to be rewritten after the present campaign, no expense or trouble should be spared to render the Roentgen-ray arrangements as complete as possible.

TRANSFORAMTION OF X-RAYS—Malagoli and Bonacini.—An article on the transformation of such rays by materials, in the nature of a discussion with Sagnac, who has written so much on this subject; they do not seem to agree with him.— *L'Eclairage Elec.*, Sept. 30.

Subscription to the AMERICAN X-RAY JOURNAL is invariably in advance. The blue pencil cross-mark indicates delinquency. The small price of one dollar quency. Personal checks are discounted in St. Louis banks, 15 cents.

The Rentgen Rays in Spina Bifida.*

BY CARL BECK, M. D.

In speaking of spina bifida one is apt to think only of its cystic form and of its location in the lumbo-sacral region. But besides this most common type there are several others, which require to be distinguished before we can choose the proper therapy. Thus it cannot be a matter for indifference whether there is (1) a so-called simple meningocele—in other words, a hernia-like protrusion of the pia, containing cerebral fluid; or (2) a myelomeningocele, a frequent variety, which is characterized by the spinal cord expanding itself, like the optic nerve, in forming the retina, around the protrusion, and, together with the pia, constituting the sac; or (3) whether there is a myelocystocele—that is, a tumor caused by cystic dilatation of the central canal of the spine.

It is also important to discriminate whether the tumor is situated in the cervical, dorsal, lumbar, or sacral region. If situated in the cervical or dorsal region, the cord cannot protrude into the hernial sac, as it does in the lumbar or sacral portion, which corresponds to the end of the cord. It is also desirable to know whether there is a hiatus in the spinal column, and how extensive it may be; and furthermore, whether or not the fluid contained by the tumor can be dislodged into the spinal canal.

In view of these anatomical distinctions, it will be easily understood that simple meningocele gives the best chances of a cure. Whether injection treatment or extirpation, however, should be preferred, is not yet agreed upon among the profession. I have cured three or four cases of simple meningocele by repeated aspiration, followed

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[1] Case presented at a meeting of the physicians of the Poliklinik, March, 1898.

by the injection of a few grams of a ten-per-cent iodoform-glycerin emulsion; and I generally prefer injecting to extirpating, provided the surface of the skin be normal. But if there be well-developed gangrene, or even any considerable abrasion of the epidermis, then septic infection of the cyst wall cannot be arrested unless immediate and extensive removal is undertaken.

On the other hand, myelomeningocele and myelocystocele offer a less favorable prospect. In these cases the injection treatment is always a failure. If in myelomeningocele the nerves are freely dispersed in the sac, the area medullaris vasculosa, after being circumcised, must be reduced into the vertebral canal, and the union of the soft tissues above must be perfected in the most minute manner. If the nerves have dishevelled themselves in the wall of the sac, the latter, after having been freely exposed, must be reduced in the same way. If situated in the lumbo-sacral region, the preservation of the nerve strings is of but little importance.

In myelocystocele the reposition should be made in the same manner. If there be any opening in the bone, protection should be sought by covering it with strong flaps, consisting of integument and muscle. It goes without saying that such delicate operations must be performed only after the most rigid aseptic precautions. Hemorrhage can be reduced to a minimum by temporary constriction, applied by a small rubber tube and by methodical interrupted compression.

According to the unanimous opinion of all authors known to me, one of the greatest difficulties encountered in the treatment of spina bifida is that its various types cannot, as a rule, be defined before operation; between meningocele and myelocystocele, indeed, the certain distinction is (often) quite impossible. Sometimes conclusions may be drawn if an opening of the bone can be palpated, or if a portion of the fluid can be reduced into the spinal canal by pressure. Paralysis of the lower extremities, of the rectum and bladder, all point to the existence of myelomeningocele; but all these signs are far from being absolutely reliable. Considering only this one point—that in meningocele aspiration should be tried first, while in the other varieties extirpation should be resorted to—it must be admitted that our deficiency in scientific knowledge makes itself felt rather strongly as regards therapy. Some authors advise opening the lower portion of the tumor first, in order to ascertain whether the spinal column is open, as in myelomeningocele, or not open, as in meningocele. Koenig and Hildebrand go so far as to emphasize the necessity of ascertaining how the nerve strings are dispersed, by first making a lateral incision into the tumor, even after they can state that there is a myelomeningocele.

All these procedures, the reason for which no surgeon would dispute until recently, are now rendered entirely superfluous by the discovery of the Roentgen rays. The skiagram shows with absolute distinctness not only whether there is an opening in the bone, but also tells of the presence and sometimes even of the expansion of the nerve substance in the sac. In those rare cases in which the presence of lipoma or fibro-myoma is in question, it is again the skiagram which gives the needed information.

The skiagram which I had made represents a formidable specimen of the lumbo-sacral type of spina bifida, and serves as an illustration of these views. The integrity of the spinal column and the cystic character of the contents of the sac are there apparent. (If any nerve strings were present, a marked shading would be noticeable.) In this case a very extensive gangrene of the surface of the tumor induced me to resort to extirpation, which verified the correctness of the skiagram. Had there been no gangrene, I should surely, on the testimony of the skiagram, have selected the injection treatment.

The patient, a boy, was five days old when the operation was performed. While this article goes to print, four weeks after the operation, he is doing well.

Physicians' Directory.

(From Journal American Medical Association, October, 1899.)

A corps of men are now at work throughout the country procuring information for the new edition of Polks Medicl and Surgical Register of the United States and Canada. This publication is now so firmly established, so widely known and universally used as to scarcely call for any comment, as it has become standard in the profession and is a book of daily reference. It is a complete directory of the medical profession of North America and all that pertains thereto. To issue such a work is a formidable undertaking, involving a vast amount of labor, but the facilities of the Messrs. Polk & Co., are exceptional. We predict for them still greater success in the coming edition, to be issued as early in 1900 as possible, and we cheerfully commend Polk's Register to the profession as an invaluable work of reference. Each succeeding issue has been an improvement on its predecessor, and we are promised that the next number shall be as near perfect as such a book can be made.

Muscular Pains.

"The following suggestions will be of value at this season. The pains of acute influenza are something indescribable, especially when associated with high temperature. To relieve these with some preparation of opium is only to increase the cerebral congestion and aggravate the extreme prostration. Sharp, darting pains are no more severe than are the dull, heavy and persistent pains in the muscles and bones which so often obtain in this disease. Clinical reports verify the value of antikamnia in controlling the neuralgic and muscular pains, as well as the fever. In fact, antikamnia may now be called the *sine qua non* in the treatment of this disease and its troublesome sequelae.

"It seems hardly necessary to indicate the conditions, when the use of two such well-known drugs as 'antikamnia and quinine' will be serviceable, nor the advisability of always exhibiting 'antikamnia and codeine' in the treatment of the accompanying neurosis of the larynx, the irritable cough and bronchial affections. Relapses appear to be very common, and when they occur the manifestations are of a more severe nature than in the initial attack. Here the complications of a rheumatic type are commonly met and 'antikamnia and salol' will be found beneficial. Antikamnia may be obtained pure, also in combination with the above drugs in tablet form."

The January 1900 Number of the Alienist and Neurologist Contain.

Outline of Psychiatry in Clinical Lectures, by C. Wernicke, M. D.; Samuel Henderson, Murderer; Responsible or Irresponsible, by Martin W. Barr, M. D.; Transitory Mental Disorder in Hemicrania, by Prof. v. Krafft-Ebing; Epilepsy Modified by Treatment and Environment, with Some Notes of Two Hundred Cases, by Martin W. Barr, M. D.; Hungry Evil in Epileptics, by Ch. Féré, M. D.; The Legal Disabilities of Natural Children, Justified Biologically and Historically, by E. C. Spitzka, M.D.;

Research in Comparative Cytology on the Nervous System of the Vertebrates, by Giuseppe Levi, M. D.; besides the usual selections, editorials, reviews, reprints, book notices, etc.

Subscription to the AMERICAN X-RAY JOURNAL is invariably in advance. The blue pencil cross-mark indicates delinquency. The small price of one dollar for this journal should not stagger any one.

Notice To Tax Payers

* * *

You will please take notice that under the provisions of an act of the Legislature

APPROVED FEB. 16TH, 1900,

I will, on January 2nd, 1900, be compelled to add and collect upon all tax bills unpaid at that time (including those of the current year) a penalty of 1 per centum per month. In order to avoid the usual rush at the end of the year tax payers are requested to call early.

Chas. F. Wenneker,
Collector of the Revenue
of the City of St. Louis.

NEESEN.—He shows that the onset of Roentgen radiation is simultaneous with the development of a retarding force which brings to rest a rotating electrode consisting of a pair of vanes having metal on one side and mica on the other.—*Ver. Deutsch. Phys. Gesell,* 1, p. 69; noticed briefly in *Science Abstracts,* Oct.

Oelling & Heinze, Manufacturers of and Dealers in X-Ray Apparatus, Electrical and Physical Instruments. Glass Blowing of every description. 70 Washington Street, Boston, Mass.

The
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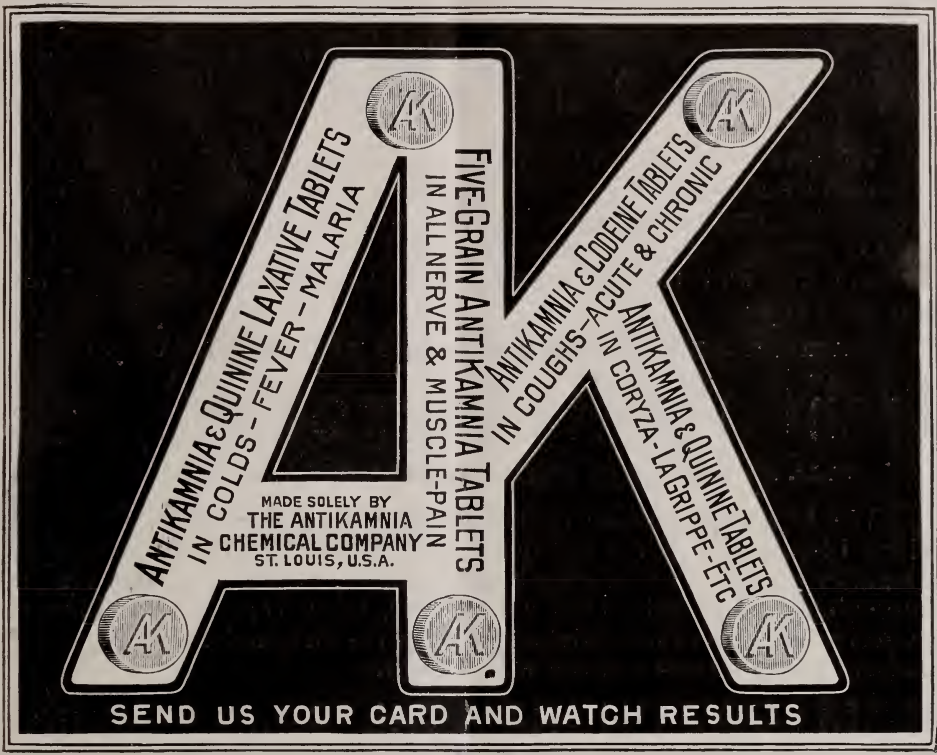

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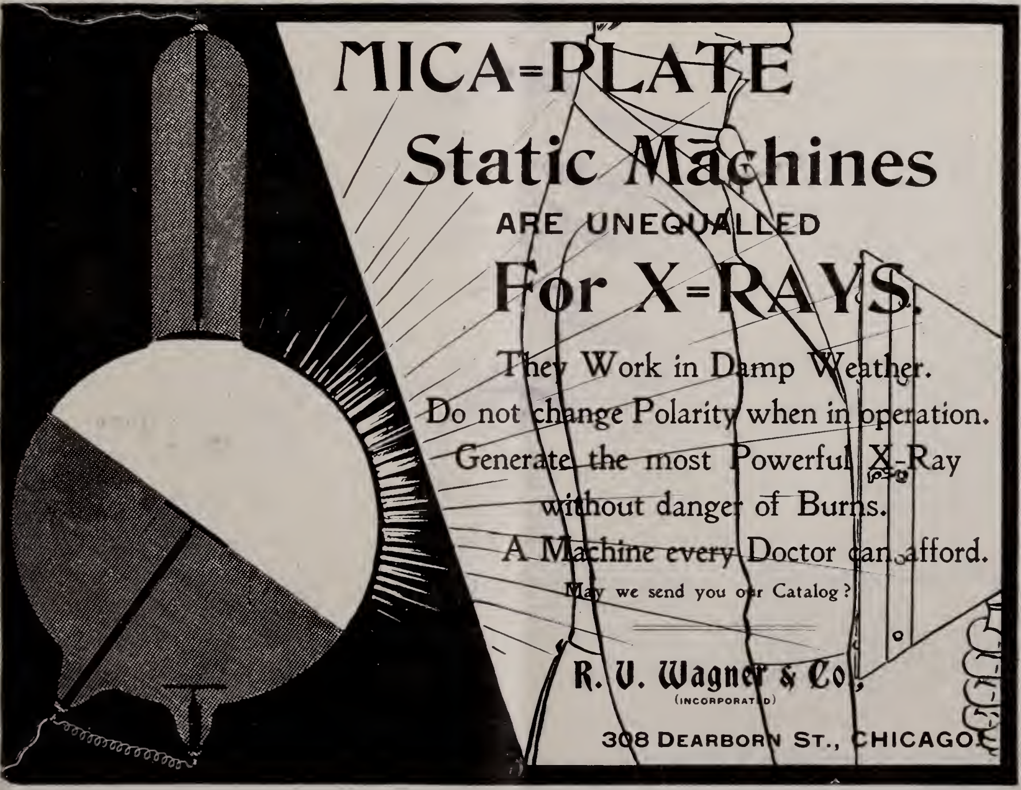

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To See Around the Corner.

Frederick Strange Kolle, M. D.

The American X-Ray Journal.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

VOL. 6. *ST. LOUIS, FEBRUARY, 1900.* *NO. 2.*

REVIEW OF AN X=RAY DIAGNOSIS.

ABSTRACT OF A PAPER READ BY JOHN DENNIS, BEFORE THE ROENTGEN INSTITUTE, FEB. 1900, AT ROCHESTER, N. Y.

The greater portion of the regular meeting of the Rochester Roentgen Institute, February 3, 1900, was devoted to a paper by the president of the institute, John Dennis. The motive of the paper was a recent x-ray diagnosis and surgical operation for the removal of a bullet, by Dr. W. W. Keen, the report of which appeared in the Philadelphia Medical Journal of January 6, 1900.

At the outset, Mr. Dennis disclaimed any intention of criticising either the surgical operation or the x-ray diagnosis upon which the explorations of the surgeon were based. At the same time, he said, it was such a notable instance of the deceptive and misleading nature of radiographic diagnosis, that he felt impelled to examine the case critically, for the instruction of the members of the institute. Mr. Dennis had taken the pains to reproduce in wood, the conditions at the cross-section as shown in Dr. Keen's paper. He also distributed to the members carbon copies of the cross-section, reproduced from Dr. Keens drawing.

After showing with the Dennis fluorometer the effect of the divergence of the rays, which misled the surgeon and necessitated the extensive explorations, Mr. Dennis quickly made a fluorometric diagnosis, and when the block was separated at the cross-section it was seen that the lines formed passed through the center of the shot, forming four right-angles about the center of the object sought. The process with the fluorometer was so simple that it was repeated at once by members of the institute. An abstract of the paper of President Dennis follows:

"In a very interesting article in the Philadelphia Medical Journal of January 5, 1900, W. W. Keen, M. D., L. L. D., has clearly demonstrated the difficulty of correctly locating foreign substances in the human anatomy. It is not my present intention to review my experience in aiding surgeons in diagnosing cases of this kind by means of the appliance which bears my name, nor to detail the many laboratory experiments which I have made during the past three years with the Dennis fluorometer. I wish just now to call the attention of members of the institute to the difficulty encountered by Dr. Keen, and his experience in exploring for a bullet. In doing so I will quote from Dr. Keen's article. He says:

"The patient brought with him a skiagraph, taken August 18, 1899, by E. W. Ames, A. A. Surgeon, U. S. Army, at the Presidilo San Francisco, Cal. This skiagraph shows the bullet very distinctly posterior to the head of the tibia. It is not, apparently, embedded in the bone.

The skiagraph taken by Mr. Prince, in the Jefferson Hospital, on his admission, confirmed this finding.

"After describing at some length the method adopted to determine the position of the bullet from the skiagraph, Dr. Keen continues:

"Nothing seemed easier that to cut down to a point so exactly indicated, and, by introducing the finger, to detect the bullet at once, and remove it with ease. An incision four inches long was made over the spot indicated, but on introducing my finger no trace of such a projectile could be found on the posterior surface of the tibia. I cut down to the bone itself at three adjacent points and by means of retractors was enabled to look at its posterior surface very clearly, but no bullet was to be seen. I then explored the posterior surface of the tibia, passing my finger between the popliteal vessels and the bone, all the way the external border of the tibia, and still could not find it. After considerable search I again returned to the original place as shown by the skiagraph. The bone was covered at this point by the fibrous insertion of the semimembranous muscle. After incising this I finally came upon the ball, *embedded below the surface of the bone*. With great difficulty I was enabled to pry out and remove it. (The italics are Dr. Keen's.)

Mr. Dennis continued:

"We have here a practical reproduction of the cross-sec ion conditions found in the limb in the case reported by Dr. Keen. It is susceptible of being severed at the cross-section for convenience in placing the shot, and for the purpose of verifying the accuracy of the diagnosis. It should be stated that the human anatomy lends itself more readily to these manipulations than does this rigid block. We will now submit this arrangement to the rays, placing the tube distant twenty-two inches, as in the case reported by Dr. Keen.

"I have prepared this block of wood in such manner as to closely reproduce the cross-section, as shown in the carbon prints you hold. Severing the block at the cross-section, I place a small buckshot at the place of the bullet as indicated in drawing, and replace the block in position.

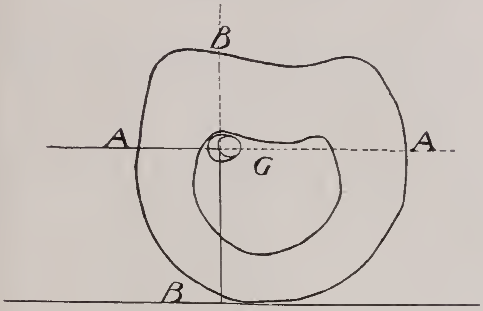
"Now, referring to the drawing, you will please follow my operation. According to my method, the end sought is to furnish the surgeon at once, without the aid of photography; first with a line around the circumference of the limb, which line shall indicate to the surgeon the cross-section of the limb on which the shot is situated. Second, to furnish him two points, marked on the circumferential line, through which a right line drawn from A to A′ would pass through the center of the shot C: third, to furnish two other marks on the circumferential line through which a straight line will pass at right angles to the first right line, through mark B, through shot C, to mark B.

"Recalling my last previous paper, you will see at once that with these guides the surgeon will be enabled by any course which conditions may indicate to explore at once for the shot on established lines and with accurate measurements, with the absolute certainty of finding it at the point indicated. For an x-ray diagnosis which would necessitate explorations to the extent indicated in the extract from Dr. Keen's paper, which I have read, would scarcely reach the standard demanded of members of this Institute.

"Now please follow me closely in order to repeat the operation.

"Selecting this fluorometer piece, which fits loosely over the limb, I place it in the slots of the cross-pieces, its base being even with the top of the table and with the fluoroscope, I adjust the tube so that a symetrical shadow of the fluorometer is shown on the fluoroscope screen with its two arms appearing as one. Placing the block which represents the limb between the arms of the fluorometer, I move the limb until the shadow of the shot is coincident with the single shadow of the two fluorometer arms. You will see at once that if I amputate the limb, or sever this block at the cross-section indicated by the two fluorometer arms the shot will be found on that cross-section. Closing the block again, I observe with the fluoroscope, and place one of the sight V-shaped pins in such position on the arm of the appliance nearest the fluoroscope in a position where the shadow of the bullet shows in the shadow of the notch of the pin.

Next, laying aside the fluoroscope I place a similar V-shaped pin on the arm of the fluorometer nearest the tube at an equal distance from the base of the fluorometer instrument with the other pin; this, of course, brings the two pins equi-distant from the top of the table. Observing again with the fluoroscope it will be seen that the shadow of the pin nearest the tube will show above the shadow of the opposite pin and shot. I note this difference by means of the fluorometer grating. I then adjust the tube until the shadows of the pins are in line, when the bullet, in this case, will show at a point below the coincident shadows of the pins. Lowering the pins equally the same distance—a distance equal to the difference last noted—and readjusting the tube, we find the two pins and the shot on a straight line, a distance above the table equal to the distance indicated by the pins. I now make a mark on the circumferential line at the pins on either side, and we have the line A A′, passing through C, the shot. And that line is susceptible wherever the patient may be, of being placed horizontal with a table if desired. On a straight line drawn from A to A′ across the cross-section, the shot will be found. Giving the limb a quarter turn, I repeat the operation forming the line B, C, B′ and marking the points of the notches in the pins as before. This line is exactly at right angles with the line A, A′, and also intersects the shot C. "Now let us see: Separating the block again and projecting across the the cross-section a straight line from the mark A to the mark A′, we find it passes through the shot. Projecting a line across the cross-section from B to B′, we find it passes through the shot, and is at an exact right angle with the line A, A′.



"In other words, the two lines projected from the surface markings form four right angles of different dimensions about the center of the shot C. The rest is a matter of simple measurement for the surgeon.

"I have gone into this matter somewhat in detail because of the importance of the subject seems to demand it, and because in your hospital practice, as in mine, diagnoses which involve explorations to the extent detailed by Dr. Keen will not be accepted."

At the College of Phys., Philadelphia, Dr. F. F. Stewart presented two slides showing greenstick fractures, Dr. Chas. Leonard presented slides showing renal calculi. Dr. A. H. Cordier showed radiographs of stones which had been purposely placed in the outlets of the pelvis.

Dr. Royal Whitman of New York City in the annals of surgery for February showed an x-ray case of separation of the epiphyses of the head of the femur and also one of coxa vara of the hip in early stage. Another interesting case is shown of a section of the epiphyseal cartilage of the neck of the femur.

SOME LESSONS FROM THE PRACTICAL APPLICATION OF THE ROENTGEN RAYS TO SURGERY.

By John Hall-Edwards, L. R. C. P., F. R. P. S. Surgical Radiographer to the general hospital, Birmingham, president of the Astor Photo. Society: Vice-president B'ham Photo. Society.

Although the x-rays have not at present, (in England) attained that position as an aid to surgery which their importance warrants, there can be no gainsaying the fact that they have taught us many valuable lessons, and are likely to teach us many others. Innovations into the realms of surgery are always received with great caution and some amount of misgiving. No matter how good they are, or in how far they are likely to mitigate suffering, they can only be accepted after a long period of probation, and then they are only allowed to take their place by a process of evolution. This slowness in accepting proved scientific facts, is not in any way due to ignorance, but rather to a general dislike by surgeons to any kind of outside interference.

To the operative surgeon the knife is the panacea for all evils, and anything which offers a chance to patients other than by the knife, is an evil thing and is not accepted until outside pressure overcomes internal resistance.

Many of our large hospitals, it is true have instituted x-ray departments, but even in these but a small number of the cases which are likely to receive benefit are examined. Hundreds of hospitals have no facilities for the production of radiographs, the practical use of which is either ignored or has never been thought over.

Some surgeons still try to find foreign bodies with the probe, or knife, and in both endeavors as usual fail.

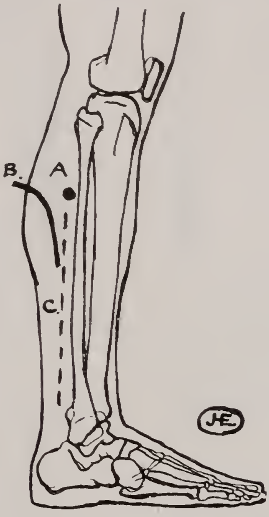
For the discovery and localization of foreign bodies which are more apaque than the flesh or bone, the x-rays are absolutely certain, and in all cases other than in those in which the foreign body can be felt, the adoption of any other method is cruel, inhuman and unscientific.

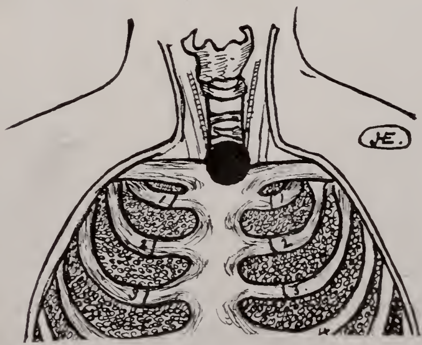
Although the x-rays have only been applied to surgical work for about three years, so much has been written about them that we would have thought that no surgeon would have been bold enough to "go" for a deep seated bullet without their friendly aid. Yet a few weeks since I saw the report of an inquest upon a patient who had died after three unsuccessful attempts to extract a bullet without the x rays. To rely upon the probe to give satisfactory information is to rely upon a broken reed. The probe as an instrument of precision is absolutely useless, and as a rule is equally dangerous.

Before the introduction of the x-rays, the restricted use of the probe was necessary, inasmuch as it was the only means at our command for localizing foreign bodies. That many people have been killed by it, there can be no doubt, and the knowledge gained by its use is so small, and unsatisfactory that we should not have been much worse off without it. As a death-dealing instrument (especially on the field of battle) a dirty and unskillfully used probe has few equals, and even in the hands of the practical surgeon its tendency is to give misleading ideas. A probe when once introduced has an inherent desire to go somewhere, and in nine cases out of ten it starts and continues on the wrong track. So frequently is this the case that in my own practice I prefer not to known in which direction the probe has gone.

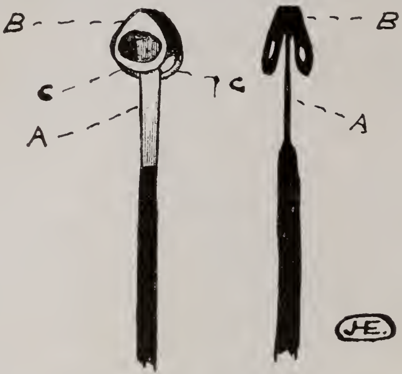
One of our leading surgeons informed me a few weeks since that the probe had never given him any real knowledge, and that except for the purpose of applying dressings he had entirely discarded its use. One of the highest tributes to the uselessness of the ordinary probe was paid by the introduction of Nelaton's special instrument, for the necessity of the latter was due to the inability of the former to detect a bullet even when touched. The telephone probe is an instrument of the same class, that is to say that with both of them, the foreign body "must be discovered before it can be found." A few weeks practical work will suffice to convince any one that the probe is a useless, dangerous and unreliable instrument. I will now quote a couple of cases in points.

X. Z., a young woman was sent to me with a history of having been shot in the head with a small "toy" revolver. The bullet entered just above the left eye, and I was informed that at the time of the accident (some three weeks previously) a probe was passed through the wound into the skull, for a distance of nearly two inches, and that on being withdrawn brain substance was discovered on the point of the probe. A radioscopic examination proved that the bullet had not entered the skull, but was flattened out upon the frontal bone. As to where the probe went in this case, I am unable to even guess.

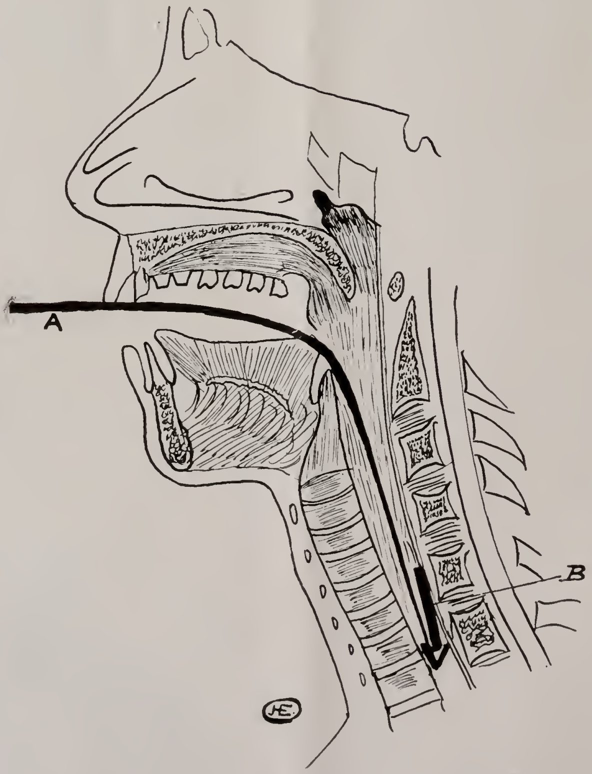




A. B., a boy of fourteen years of age was accidently shot in the calf of the leg with a "toy" pistol. When sent to me, he had a scar about seven inches in length down the side of the leg, and a drainage tube five inches in length was inserted through the wound caused by the bullet. I was informed that a probe passed directly after the accident went in a downward direction for five or six inches. An operation had been performed and the track of the bullet followed without result. The incision made during the operation was seven inches in length, and is shown on the dotted line in Diagram I. (c.) The drainage tube B. is placed in the track made by the probe whilst the true position of the bullet is shown at A. In order that the tube should show in the radiograph I withdrew it and filled it with iodoform. On showing the radiograph to the surgeon I was informed that it must have moved. The operation for extracting it occupied about five minutes, a two inch incision being ample for the purpose. Proving that the bullet had not moved, was the fact that by the side of it lay a small piece of cloth which had been carried in with it. The probe in this case made a false track and led to a serious operation which might have been avoided had the x-rays been applied in the first instance. I could quote numerous cases of the same sort, but these two are sufficient for my purpose, so I will pass on. During the last two years eighteen cases of coin in esophagus have come under my notice, and there are one or two important lessons to be learned from them. In five of the cases the coin had been in the gullet for periods varying from three months to five weeks without serious consequences. They were all situated in the same position, viz.: on a line with the top of the sternum, and the face of the coin was in each instance turned forwards. (Diagram II) With the exception of the first case which came under my notice and which was removed by operation (esophagotomy) they have one and all been removed by means of the coin catcher within a few minutes of their positions being ascertained by means of the x-rays. After having depreciated one surgical instrument in general use, it is a pleasure to laud another which is generally believed to be useless.



The Coin-Catcher, (Diagram III.) is absolutely certain to achieve the results for which it was designed if properly used. It consists of a whale-bone stem in the ends of which is fixed a piece of watch-spring, A. on the ends of this, on a loose hinge is fixed a minature anchor, which moves freely from one side to the other. When this is passed down the gullet which contains the coin and past the obstruction, one of the free arms (c) (c) pass beneath and behind the coin, so that when the instrument is withdrawn one arm grips the coin and brings it up.



(Diagram IV.) shows the method in which the instrument acts. A. Coin-catcher. B. Coin. Until the discovery of the x-rays the coin-catcher was generally held to be a useless instrument, many surgeons preferring to operate, rather than to try it. The positive knowledge which is gained by means of the fluorescent screen has, however, taught us that it can render invaluable aid.

In several cases which have come under my notice the coins had been in the escophagus for a lengthy period, with but slight apparent discomfort to the young patients, hence there existed much doubt as to the presence of a foreign body at all, and it was only after the application of the x-rays that the diagnosis was made a matter of certainty. The difficulty in all cases ascertaining the presence of a coin without the x-ray, leads me to ask: What became of such cases before their introduction? In all probability many patients died without the direct cause having been discovered. A coin left undisturbed would ultimately slough through into the trachea, and the patient would die from a septic pneumonia. I have no doubt that many lives have been spared by the use of the x rays and have no hesitation in recommending the coin-catcher as a most useful and efficient instrument.

It would be an easy matter to point, to many more valuable lessons brought home to us by the x-rays, but as my article has already exceeded its bounds I must defer these for another occasion.

161 Newhall Street, Birmingham, England.

X=Ray Case Book.

We have been asked several times for an atlas of the anatomy of the human body for the purpose of keeping pictoral records of x-ray findings. Late in 1899 David Walsh, M. D., Hon. secretary of the Roentgen Society, London, Eng., published the "X Ray Case Book" for the purpose of noting apparatus, methods and results with full diagrams of the human body and skeleton, together with diagrams for special cases. The sheets are 9 x 12 inches. This is the best thing offered for keeping records of the work of the x ray diagnostician.

The books with 50 sheets can be had for 75c. Orders should be sent to Bailliere, Tindall & Cox. 20 King William Street, Strand W. C., London, Eng.

A series of x-ray articles by competent authorities with many illustrations consumed most of the January 1900 issue of the Philadelphia Medical Journal.

It is significant to notice the number of medical journals that are taking interest in x-ray work this year.

EXCITATION OF THE CROOKES' TUBE BY THE STATIC MACHINE.

CHAHTER 3

Convective Discharges.

BY JOHN T. PITKIN, M. D.

In elementary works upon electricity is usually figured a Leyden jar, having projected from its top a small metallic ball electrically connected to its inner coating. At the same elevation, a few inches to one side is shown a second ball of similar size and composition, supported upon a conductive rod through which it is connected to the outer coating of the condenser.

If the Leyden jar is electrically excited, a small pith ball hanging dependantly by a silken thread suspended equidistantly between the metallic bulbs will be set in motion by the electrical energy of opposite polarity, with which the bulbs are charged, in accordance with the law of attraction and repulsion, i. e. dissimilarly charged bodies attract but similarly charged masses repel each other. The pith ball will vibrate to and fro, carrying with each pulsation an electrical charge from the positive to the negative bulb, then vice versa, these oscillations will continue until the potential of the bulbs is thereby reduced to zero. The foregoing process is given as illustrative of the modus operandi of convective discharges. Between the metallic balls in which the discharging rods of the prime conductors of a static machine terminate, the electrical manifestations are of a similar nature, the pith ball being replaced by the particles of the atmosphere. The length and rapidity of the discharge will depend upon the difference of potential, i. e., pressure or voltage and its character for a given air space, depends upon the quantity or number of lines of force in a given time, i. e. milliamperage of the current. It also determines whether it shall be a spray, a brush or a spark, and if there are lines enough for the last mentioned variety of discharge whether the spark will be thin or fat. An air space through which the electrical current appears to leap is called a spark gap. For purposes of investigation let us divide such spaces into intrinsic or useful and extrinsic or wasteful. This subdivision will be refered to under another heading, where we will try to prove that only the air gap between the prime conductors of a properly constructed apparatus can be considered beneficial. Should the negative discharging rod of the machine be replaced by a concave aluminum electrode, and the positive rod by a platinum target, and both pole and the intervening air gap be inclosed within a glass bulb from which the air has been nearly exhusted, i. e. a Crookes tube, the convective discharge between the metallic surfaces becomes manifest in the form of x-radiance. The higher the voltage of the exciting apparatus the greater will be the velocity of the inter bulbular molecules and the severer the bombardment of the target placed at proper range in their mean path. The larger the amount of electricity supplied in a given time to the cathodal electrode, providing it is of adequate areal expansion, the larger will be the amount of the convective discharge and consequently the volumn and density of the x-radiance emitted from the reflector.

May we not at least express the hope that the time is not far distant when we can replace our present empirical x-ray methods by others based upon mathematical exactness employing the C. G. S. units of length, mass and time which are now being applied to other branches of the science of electricity, wherewith we will be able to compute the relation between the efficiency of the static generator on the one hand and the Crooke's tube on the other, their mutual adaptation and consequent x-ray usefulness e. g. So many units of pressure or volts capable of developing so many unites of velocity and x units of electrical quantity or milliamperage, giving rise to x units of Crooke's lines of force within a tube of x mycrofarads capacity will develop x units of x rays or so many Roentgens?—BUFFALO, N. Y.

PHOTOGRAPHY IN HOSPITALS AND MEDICAL COLLEGES.

BY PROF. JOSEPH F. SMITH, X-RAY LABORATORY, PRESBYTERIAN HOSPITAL.

Within the last few years many hospitals and medical colleges have been equipped with laboratories and apparatus for the medical and surgical application of the Roentgen ray. These laboratories are, of necessity, under the management of persons more or less skilled in photography, and therefore offer a splendid opportunity for a very useful application of the "older photography" in the collection and preservation of photographs of interesting pathological conditions and specimens. Such a collection of photographs would form a valuable source from which to draw illustrations for medical and surgical works and also serve as useful records of interesting cases. The photographs could be filed with the history sheets and in this way would be readily accessible for reference at any time, or the entire collection might be classified and indexed.

A few words about the outfit suitable for such use may not be out of place. Work will have to be done under all conditions of light (or darkness) on all kinds of subjects and often under the most adverse circumstances. Hence an outfit for such work must be portable, easily manipulated, compact and yet capable of doing any kind of work that a photographer is ever called upon to do.

The camera and support. The tripod should be heavy and firm, capable of supporting the camera with the bellows drawn far out. As work will often have to be done on concrete, marble or other smooth floors, rubber tips, such as those used on crutches will often be found useful.

The camera should be at least 5 x 7 with reversible back, swung inward and falling front and back focus, or better, a camera that may be used either as a front or back focus camera. Often in photographing rather small specimens when a rather large image is desired a back focus feature will be found almost indispensable.

The lens is the most important part of the entire apparatus. It should be extremely rapid, covering at full aperature the plate used, having a flat field and good depth of focus. As the conditions of light are often bad speed is a most desirable quality. One of the modern flat field lenses should invariably be selected and no lens can be found that excels the Soightlaender Collinear for this work. For a 5 x 7 plate a Series II. No. 4 working at an intensity of F 5.6 or a Series II. No. 5 working at F 6.3 will give the best results for general work.

The plate should be the most rapid obtainable. For general work the Cramer Crown will be found entirely satisfactory, and for photographing prepared specimens, dissections, operations, etc., the medium Isochromatic will yield the best results.

CHICAGO, ILL.

To See Around the Corner.

A Boston firm sells, under the name "X-Ray Camera," an apparatus which apparently enables an object to be seen through any opaque substance. It is hardly necessary to say that the x-rays have nothing whatever to do with the phenomenon, which is really produced by a set of four hidden mirrors, that conduct the light around the opaque object.—Ex.

The price of the Rochester Fluorometer has been reduced to meet the wants of the surgeon and physician using x-rays. This essential adjunct to correct x-ray work is sold with the case of instruments and a frame suitable for holding cross pieces and an upright holder for screen and x ray plate also accompanies it. This frame can be used on any table or two tables. We will gladly assist x-ray workers with any information they desire on this subject.

In Cosmos January 6th, is an article of a general nature giving a summary of the development of our knowledge of the x-rays.

PRACTICAL SUGGESTION.

BY J. RUDIS-JICINSKY, A. M., M. D.

It is not necessary to describe and illustrate the recent inventions, discoveries, and improvements by means of which physicians and surgeons are now enabled to study and treat disease so much more satisfactory and successfully than in former times. But one thing is now sure, that the x-ray is very good help to us, especially in bone-surgery and in cases where foreign objects have to be found in the human body, for such cases the value of this means of early and proper diagnosis can not be disputed any more—its beyond the experimental stage, and has to stay. Along the line of other good means of diagnosis, we must not introduce anything that would mislead, nor omit anything that can be of practical service to us. And the x-ray is one of the most practical things. The result of scientific progress and to us an application, which help us not only *to feel* a lesion, but *to see*. The "tactus erruditus" may be educated and practised to the highest point of development, but it can not replace the value of good vision. Just think of it, how the photography developed in the last decade of our times, and if I am not mistaken the shadow-picture of Napoleon Bonaparte is one of the best, as far as yet, the most acurate, the main foundation of many and many portraits of that great man. Shadow picture only! And what are the radiographs? Same, simple shadow pictures, which in our method of treatment of fractures, dislocations, etc., a greater revolution have wrought and gave us a simple means of diagnosis, diagnosis which is correct and easily may be proven. But we must not forget that we are dealing with shadows only, that one radiograph may not appear like the other one and that a slightest change in position may, in spite of perfect technique and thorough anitomical and pathological knowledge, produce grave errors of diagnosis. These errors are made very often, but the errors of diagnosis by the old way are still greater. Then the trouble is that men who have purchased an x-ray outfit to-day consider themselves "experts" to-morrow and do more harm than good with their pictures (done without fluorometer or any other proof of accuracy.) I think that we should never be satisfied with one radiograph of a respective case, but make few radiographs from different positions and compare also the picture of the injured part with the normal one, using in every case a fluorometer. I went to work to study the means of diagnosis in cases of injury of the head and tried my best in experimenting to illustrate with comparatively very short exposures, the increasing efficiency of the Roentgen light.

But how easy an error could be made! The following case will illustrate the usefulness of the x-ray on one side and the danger of a mistake on the other. In reporting the case I fully realize that one or two cases are very little to build on, but let us see:

Joseph J. B., aged thirty-nine years, sunstroke six years ago. Since that time had complained of dull, persistent headache on the left side of the head; changed disposition, was irritable, had vertigo, dyspepsia, vomiting, soon followed by slight palsies, but no convulsions. Lately, retention of urine and symptoms more obscure. The tone of the muscles and intellect were unimpaired.

Patient brought to me for x-ray examination. With the parts of the head not examined covered with stanniol and those exposed shaved and oiled, I made about six radiographs. The first one revealed nothing special, but the last one showed plainly, under the parietal bone at the sagital suture on the left a large epidural clot. The clot amounting to four ounces, was removed, and recovery followed in three weeks without any complication. Spark used, twelve inches; distance of the tube from the object, ten inches; plate right behind; duration of exposure five seconds; angle at which the picture was taken, 36°; plate of tungstate of calcium over the dry plate to shorten the exposure; Wehnelt's interrupter used. Patient in elevated position; head low down.

This experience in one case shows plainly the necessity of always taking more than one radiograph in different positions. First picture was negative and pointed to a non-operative line of treatment together with the obscure symptoms; the last one gave us altogether different view of the status. I would not advocate giving up any of our methods of making diagnosis, but think that the application of the x-ray will be considered appropriate to confirm our diagnosis with all the evidence in each case, which may be procured for the benefit of our patient.

CEDAR RAPIDS, IA.

In the radiograph the abscess showed very distinct but in the half tone when reproduced on paper it lost the sharp definition of the clot.—Ed.

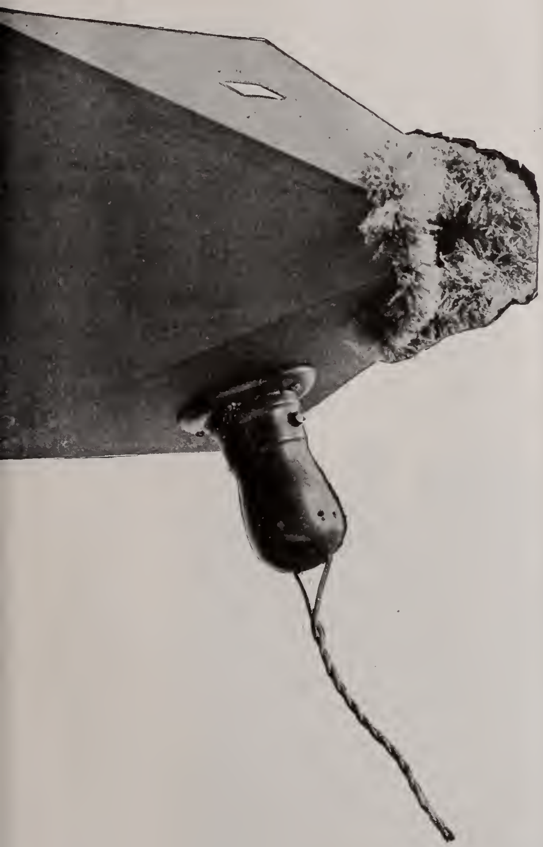
AMERICAN X-RAY JOURNAL, ST. LOUIS, MO.
HEBER ROBARTS, M. D., EDITOR.
ELDORA, IA., JANUARY 5, 1899.
EMERGENCY HOSPITAL.

Dear Doctor:—I enclose herewith my subscription to your journal. I have just returned from a trip East, including Cincinnati and your city, and desire to call your attention to a very important matter concerning the taking of skyagraphs which seem to be unknown to all the experts whom I have had the pleasure of visiting or conversing with, viz: While in the act of taking a skiagraph it is a simple matter to watch the impression made upon the plate (negative) or watch its formation by crawling under the table and placing the fluoroscope immediately against the under surface of table, and looking upwards. I always have my nurse or assistant make the observation and when the skyagraph or negative seems plain and distinct, the x-rays are discontinued. This not only saves time but saves many negatives also and renders obsolete the question of seconds or minutes in making exposures.

Very truly yours,

N. C. MORSE, M. D.

Since the Wehnelt interrupter has been successfully employed to increase radiant energy with a coil the following matter taken from Vol. 1, No. II. of the American X-ray Journal may be of interest. The switch has been used very little with static machines.—Ed.



Within a few months following Prof. Roentgen's announcement of the x-ray phenomenon the editor of this journal had constructed a Tesla high-frequency coil for x-ray work. It was the first apparatus of the kind made for this purpose. Constant application of the instrument to fluoroscopy and skiagraphy revealed a want and imperfection in the picturing. It was this fault which caused us to conceive of a method for its improvement. The fluoroscope and switch in handle herein shown was made by an Eastern concern on receipt of the following from us:

St. Louis Mo., July 20, 1896.

L. E. KNOTT APPARATUS CO., Boston, Mass.

Gentlemen.—The power of the Roentgen rays is at present all that is required, but some method of utilizing it to better advantage is demanded.

Radiographic pictures as well as fluoroscopic views of the softer structures are essential.

It is impossible to get a good picture of a tumor, or of any consumptive area, or of any fleshy induration with any existing device. It also requires much study to differentiate with the fluoroscope diseased from healthy tissue in the interior of the body. This fault lies with the slow method of cutting off the electric current, which should be instantaneous. The cut-off should be under control of the operator, on the fluoroscope, and under the thumb. The picture, consciousness of it and interception of the current should be, as nearly as possible, simultaneous.

There should be a slide space in the outer fluorescent end of the fluoroscope for the purpose of receiving the sensitive plate. A perfect apparatus will excite a discharge tube which will readily cast a shadow of the softer tissues followed immediately by transparency, then a shadow of the denser structures, progressing in this way until all of the parts are lost. The view wanes before the sight not unlike the mellow receding rays of the northern lights.

With the improved method of cutting off the rays a picture of the internal structures is readily produced. When such a picture is brought well into view, cut off the current, slide in the sensitized plate, keeping the eyes still in the fluoroscope. When all is ready turn in the current. The picture will now soon appear in the fluoroscope, and at the same instant on the sensitized plate. This is the moment when loss of time destroys the picture. With some degree of care, combined with the instantaneous cut-off under the operator's control, a perfect picture can be obtained.

Yours truly, HEBER ROBARTS.

Since this was written, and since the

instrument has been put to actual test, we desire to retract some of the claims made for it. While it is a practical and valuable device, experience has proven the inadequateness of a sensitized plate to be affected by the x-rays at all times sufficient to make a picture at the moment of fluorescence. When the rays stream out in great quantity and force, a picture of denser structures in rapid succession dawn before the eyes, but the plates fail to respond to the outlines of softer tissue with the promptness suggested. The plate is not influenced as by light rays. Visible shadows upon tungstate of calcium or other fluorescent material has not been made to synchronize with a fixed shadow upon a sensitized plate.

NOTES.

BY J. HALL EDWARDS, M. D.

The "Princess of Wales" hospital ship which sailed for the Cape about the middle of December was provided with a special, portable, X-ray equipments manufactured by Messrs Harry W. Cox, Limited.

The coil which gives a nominal 10" spark was specially designed and constructed in conjunction with Dr. Hall-Edwards, Radiographer to the General Hospital, Birmingham, for Field Work Hospitals, Railway Companies and others requiring to carry the apparatus from one place to another.

This handy form of apparatus has been adopted by several of the hospital ships and I hear that the war office have ordered several for special service on the field. A 10" coil contained in a strong iron-bound case weighs less than 25 lbs.

"The Lancet" of December 23d contains an interesting contribution from Sir William MacCormac from the seat of war. He describes the excellent arrangements at the base hospital at Wynberg, eight miles from Capetown. A special room is set apart for x-ray work. Sir William speaks highly of the work of this department, and declares it to be fitted with the most modern apparatus. In describing the effects of the Mauser bullet, he says, that in three-fourths of the cases, if not even in a larger portion, it was impossible to tell the exits from the entrance wound and that it is exceedingly rare for the bullet to lodge in the body of the patient.

Apparatus in Actual Use on the Field.

The "Roentgen Society" is fast growing

in popularity, a large number of new members having been recently elected. On February 1st, Dr. Hugh Walsham will read a paper on "Roentgen Rays in Diseases of the Chest" and on April 5th, Dr. Norris Wolfenden and Dr. Forbes Ross will give papers on "The Influence of the x-rays upon the Growth and Development of Micro organisms."

The British Medical Journal says: The sets of apparatus supplied for x-ray work in the field in South Africa may be pronounced to be complete and thoroughly up-to-date. Each set contains six focus tnbes; a 10-inch field service induction coil, with condenser and commutator; two pairs of conducting cords and four ebonite pillars packed in teak cases; two lithanode portable batteries, with six cells of 30 ampere-hours; one fluorescent screen with cryptoscope; a voltmeter; a stand for x-ray tubes; spare wires; a portable cross-frame localizer of Mr. Mackenzie Davidson's pattern, with stand and accessories; a stretcher with tube-holder and plate-holder; nine dozen Edwards's cathodal x x x plates of various sizes, material and apparatus for developing, printing paper and printing frames, and black and ruby fabric.

EXTRAORDINARY SURGICAL FEAT. -- A wonderful triumph in surgery, achieved by Dr. Hermann von Schrotter, of Vienna, is reported by the Daily Chronicle's correspondent in that city. A boy, aged twelve, had swallowed a piece of lead of the size of half a sovereign, which passing through the trachea, descended into a bronchus of the second order. Dr. Schrotter extracted this piece of lead without tracheotomy, and even without using anæsthetics; the operation was, nevertheless, quite plainless. First by means of the Roentgen rays the piece of lead was discovered located at the height of the fourth ib; then Killian's (Berlin) bronchoscope was in the ordinary way introduced into the trachea and electrically lighted up, and the piece of lead was at last extracted by a pincette expressly constructed for the purpose.

ANOTHER SURGICAL FEAT.—A correspondent states that near Arbroath a little girl swallowed a screw an inch and a half long. A surgical operation would have endangered the child's life. The doctor took some fine strands of raw silk and mixed them with some bread, which the girl was induced to swallow. He waited eight minutes for them to revolve in the stomach. Then he pulled up the threads, and the screw came out, having been enmeshed in the silk.

ANOTHER AID TO SURGERY.—The cinematograph seems likely to become as important a factor in surgery as the x-rays—at least for the purpose of lecturing it bids fair to become invaluable. Dr. Doyen, the famous French surgeon, last week gave a demonstration by its aid of his world-renowned rapid methods of surgery before the Gynæcological Society. So faithful was the reproduction that even had he not been there every step of the operations shown explained itself. The most difficult and delicate operations were performed before the very eyes of the audience, and it became very clear that as a method of instruction in surgery upon the living body the cinematograph would be the most valuable assistant yet discovered.

A NEW USE FOR ROENTGEN-RAY PHOTOGRAPHY.—In a paper lately read before the Royal Society by Messrs. C. T. Heycock, F. R. S., and F. H. Neville, F. R. S., they described a method of making photographs of sections of particular alloys of gold they were experimenting upon. It consisted in using Rontgen rays instead of taking a negative by reflected light. The negatives so obtained were enlarged. and, say, the writers, "the contrast between the Roentgen-ray photograph and the surface photograph of the same alloy shows what a much better picture of the structure of the alloy is given by the Rontgen rays."

Treatment of a Case of Facial Neuralgia.

Bernays (*"Report of a Surgical Clinic"*) cites a peculiarly obstinate case of facial neuralgia with treatment. The patent was a lady aged fifty years, who showed a good family history and whose previous health was also good. The trouble began with a severe neuralgic toothache of her lower right molars, and was paroxysmal at first, but after two months became continuous. The paroxysms generally occurred in the early morning, and entailed much acute suffering. The pain was relieved by biting strongly upon some firm object, but returned immediately when the pressure was removed. The touch of anything cold or hot promptly excited a paroxysm. A moderate heat when sustained produced the opposite effect. In the effort to afford relief four molars were extracted, but without success. The patient strenuously held out against the use of narcotics in any form throughout the entire course of the disease. Antikamnia in ten grain doses (two five-grain tablets) was found efficient as an obtundant, and was relied upon exclusively. Eight weeks after section of the nerve, when the report was written, there had been no return of her former trouble in any degree.—*The Medical News*, Jan. 13th.

Alterative Medication.

Henry (Medical Essays) points out the essentials of a successful tonic and alterative medicine. Such combination will ultimately fail if it is not well adapted to the demands of an extended course of treatment. Among facts which may be considered as most thoroughly established by clinical experience are the peculiar tonic and alterative value of the salts of of iron arsenic, and mercury. They promote appetite, digestion and assimilation, in a word are tonic, and improve the general condition of the system by correcting errors in fluids and functions, in other words are alterative. The combined action of these three drugs is three-fold and the action of one is supplementary of the others. He prefers the proto-chloride of iron which stimulates all the glands of the stomach and augments the blood making functions. This action is supplemented by the sedative and oxygen carrying power of arsenic and the intestine and liver stimulation of the bichloride of mercury. Besides all this when these remedies are properly combined, as in the elixer of the three chlorides (Henry), they do not disturb digestion, cause constipation or produce other unpleasant effects.

Look for the Adv. that will

Occupy this Space

in March.

THE AMERICAN
X-RAY JOURNAL.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

PUBLISHED MONTHLY BY THE AMERICAN X-RAY PUBLISHING COMPANY.

HEBER ROBARTS. M. D., M. E., Editor.

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OF PHILADELPHIA

ELIZABETH FLEISCHMAN, Radiographer. San Francisco, Cal.

The American X-Ray Journal.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

VOL. 6. *ST. LOUIS, MARCH, 1900.* *NO. 3.*

ORGANIZATION OF THE ROENTGEN SOCIETY OF THE UNITED STATES,

Pursuant to a call by Dr. J. Rudis-Jicinsky of Cedar Rapids, Ia., for a meeting of a number of workers with the x-rays to convene at the office of the American X-Ray Journal, St. Louis, Mo., March 26th, representatives from several States met at 10 a. m., at the above named place and date and effected an organization—the Roentgen Society of the United States.

Monday, March 26, 1900.

Meeting called to order by Dr. Heber Robarts, at 10 a. m., at the office of "The American X-Ray Journal," St. Louis, Mo.,

States represented: New York, Ohio, Illinois, Missouri, Iowa, Nebraska, Kentucky, California and Texas.

President elected: Dr. Heber Robarts, St. Louis, Mo.

Secretary: Dr. J. Rudis-Jicinsky, Cedar Rapids, Ia.

Constitution formulated by the officers named, read and adopted.

Official name of this association shall be: "The Roentgen Society of the United States."

The preliminary steps necessary in procuring the charter shall be made with the object in view of a national organization. All those wishing to become charter-members may do so by sending five dollars annual dues, with the necessary application directly to the secretary of the society. Charter shall be open until the next regular meeting in December, 1900.

Place of the next regular meeting decided upon: New York City, N. Y.

Membership blank shall be published in the March and following numbers of The American X-Ray Journal and all the subscribers of the same may become charter-members without credentials and extra expense, on payment of the annual dues, five dollars, but until December, 1900 only. Remittances should be made by check, draft, registered letter, money or express order, direct to the secretary.

"The American X-Ray Journal" is accepted as the official organ of the Roentgen Society of the United States. Members of this society receive the Journal free.

Mr. Nikola Tesla, of New York, N. Y., inventor eminent in the x-ray work and very active in this branch of science was named the first honorary member of this society and the secretary instructed to announce this fact to him.

The by-laws and all other necessary steps in perfecting the organization of this society shall rest in the hands of officers elected, subject to approval of the society.

About one hundred letters of the men who sympathize and will co-operate with the society, eminent men from all parts of the country were read and accepted with thanks.

Adopted, that the transactions of this meeting be published in the Journal and so enacted.

J. Rudis Jicinsky,
Secretary.

St. Louis, Mo., March 26, 1900.

THE ROENTGEN SOCIETY OF THE UNITED STATES.

Application for Membership.

........................1900.

I hereby make application for membership in the Roentgen Society of the United States.

Signed.................................
FULL NAME.

P. O. Address.............................

$5.00 must accompany each application. There is no initiation fee. Send this slip with enclosure to Treasurer,

DR. J. RUDIS JICINSKY,
Cedar Rapids, Iowa.

CONSTITUTION.

ARTICLE 1.

This society shall be known as the Roentgen Society of the United States.

ARTICLE 2.

The object of this society shall be the advancement of the knowledge of practical x-ray work and allied arts and sciences: The promotion of this branch of surgery and medical science, systematic original research, the uniformity of support to the inventive talent and promotion of harmony and fraternity in the professions devoted to this science, the protection of the interests of its members and the promotion of all measures adapted to the practical application of the x-ray for the benefit of the community and physical improvement of man.

ARTICLE 3.

Section 1.—This society shall consist of honorary members, permanent members, members by invitation and corresponding members, who shall be physicians and surgeons, dentists, investigators, authors on x-ray topics, inventors, radiographers, or their assistants in hospitals, military or State institutions, technical electricians, chemists, teachers of chemistry and physics, specialists and experts in electro-technique, qualified by at least one year in experience with radiant matter, its application or therapeutical use.

Section 2.—Permanent members shall be residents of United States. Honorary members and corresponding members, eminent in the x-ray work and active in promoting its interests in foreign lands or home, may be elected as such by a vote of two-thirds of the members present, but not more than three such members shall be elected at any annual session.

Section 3.—Members by invitation shall consist of delegates from corresponding societies or institutes, and of reputable professional men and experts active and prominent in radiographie, who shall be introduced by at least two members present, or by letters signed by two permanent members, when they may receive their appointment by a vote of the society, and shall hold their connection with the society until the close of the annual session at which they were received, with the privilege of participating in all the business of the society except the right of voting.

ARTICLE IV.

The officers of this society shall be a president, first and second vice-presidents secretary, assistant secretary, treasurer and board of trustees. The officers shall be elected annually.

ARTICLE V.

Section 1.—The president shall preside at all meetings of the society, preserve order and decorum, decide questions of order, subject to an appeal to the society. He shall deliver (or if absent, shall furnish to be read) an address on some suitable subject at the opening of the annual meeting, subsequent to his election.

Section 2.—In the absence of the president, the senior vice-president shall act as president, and perform the duties of his office.

Section 3. The secretary shall keep, or cause to be kept, a correct record of all transactions of the society in a permanent form and publish the same in the official organ of the society, in The American X Ray Journal, St. Louis, Mo.; give due notice of the next ensuing annual meeting by sending a notice to each member and in the official organ of the society at least two months before such meeting, notify all members of committees of their appointment and of the duties assigned to them. He shall hold correspondence with other permanently organized medical and scientific societies, serve as a member of the committee of publication, supervise the distribution of the published transactions to all members who have paid the annual assessment, and carefully preserve the archives and unpublished transactions of the society.

Section 4.—The assistent secretary shall aid the secretary in his duties and perform them temporarily when the office is vacated by resignation, removal or death.

Section 5.—The treasurer shall receive and be accountable for all moneys that shall come into his hands by virtue of any of the by-laws of this society, or otherwise, he shall give good and sufficient bonds to the trustees for the safe-keeping and disposal of his trust, and shall make a full report to the society annually.

Section 6.—A Board of Trustees consisting of three members, shall be elected. One member elected each year shall hold office for the term of three years.

The trustees shall hold the bond of the treasurer, and take general supervision of the affairs of the society, not otherwise provided for. At the request of the majority of the members, the president of this board may call special meeting or change the time of holding the annual meeting of the society.

ARTICLE VI.

This society shall hold its regular meeting annually and call meetings as provided by Section V.

ARTICLE VII.

No person shall be received as a delegate nor allow to sit as a permanent member, nor as a member by invitation, who is known as a "quack," or under sentence of expulsion or suspension from any scientific or medical society; or is not in good standing in regard of annual dues with this society.

ARTICLE VIII.

The following standing committees shall be organized at each annual meeting:

A committee of arrangements, of which the assistant secretary shall be a member. They shall make all necessary steps in arrangement for the next meeting.

A committee of publication of which the secretary and treasurer shall be members, to procure the publication of the transactions under the direction of the society. The committee will be expected to use their discretion in publishing only such reports and papers as, after careful examination, it may conclude will be instructive and do credit to the society.

A committee on Necrology, shall collect such facts in regard to the personal history and professional career of its deceased members, report the same to society, which report shall go to the committee on publication.

A committee on conduct, of which the retiring president shall be chairman. They shall investigate and report upon all cases of differences arising between members.

A committee on revision of the constitution and by-laws shall be appointed each year, to whom shall be referred any proposed change or amendments, which must be submitted in writing at the first session of the annual meeting and adopted at last session, if the vote be unanimous; but if not, it must lie over until the next annual meeting.

ARTICLE IX.

Every member of this society, when presenting his credentials, shall pay the treasurer the sum of $5.00 and sign the constitution. Members receive the American X-Ray Journal free. Subscribers of the Journal may become members of the society without credentials, if they are members of medical or other scientific societies and pay $5.00 dues.

ARTICLE X.

The fiscal year of the Roentgen Society of the United States is from Jan. 1 to Dec. 31. The annual dues for the following fiscal year are payable in advance, and shall be such as fixed by the by-laws, which if allowed to remain unpaid for two years shall cause a forfeiture of permament membership that can be renewed only upon the recommendation of the committee on conduct.

Long exposures through thick portions of the body veil or fog the picture. M. P. Villard, in a note to the Paris Acadamy of Science, says that the fluorescence of the surrounding air appears to be the source of the second image and general fog. Prof. Roentgen, fully explained this in his second report on the Phenomenon of the x rays. The particles of air that are so charged, or give off x rays, are capable of casting a shadow of an opaque substance upon the plate from its under surface. It is in this manner that a nail or screw in the table may be seen in a radiogram.

The magnifying action of the x rays is further intensified by having both sides of the glass plate coated with emulsion. This plate should be placed between two fluorescent screens with the crystals in contact with the films. This gives two images and double density and the exposure is shortened to one fourth the time in case of films.

Dr. Hall Edwards has recently sailed for Capetown, South Africa, as surgical radiographer to the Hospital of the Imperial Yeomanry.

EXCITATION OF THE CROOKE'S TUBE BY THE STATIC MACHINE.

Magnetic Discharges.

BY JOHN T. PITKIN, M. D.

CHAPTER IV.

When a metallic conductor is excited by a battery or a dynamo among the different varieties of force made manifest, are two which are inseparable and interdependent. They are electricity and magnetism. So intimately are these twin forces associated, that their duality is frequently forgotten and their diverse phenomena almost inextricably confounded. In the introductory chapters of text-books on electrology, the authors treat exhaustively of, first, magnetism, then electricity. They carefully delineate their diverse properties and functions, while in the subsequent chapters the former variety of force is seldom mentioned and the important role which it plays is usually credited to the action of electricity by induction or influence, as much as to intimate a mysterious or uncertain method of transition from one conductive path to another. If, however, we consider the process called induction as 1st, the formation of a magnetic field around an electrically excited conductor, 2d, the magnetic discharge of a portion of the field onto another placed in juxtaposition or onto the original conductor, causing electrification of the former, or the so-called extra current of the latter, then there can be no objection raised to this otherwise ambiguous terminology.

So, generally, is the action of magnetism ignored by the masses that they credit electricity with wonderful mechanical power. They consider that electricity propels the street cars and automobiles, turns the wheels of many industrial plants, operates various recording apparatus employed in the telegraph and telephone service, also call-bells, enunciators, etc., etc., whereas, it is really magnetism which turns the wheels and moves all of the levers necessary for the achievement of the mechanical processes enumerated. In our study of the Excitation of the Crooke's Tube by the Static Generator, we will endeavor to (1st) draw the line sharply between these allied forces; (2d) show their interdependence; (3d) determine how they can best be made to co-operate with each other in the production of x-radiance. In differentiating between electricity and magnetism, we find that the former requires a conducting path, whereas the latter permeates the insullation and surrounding medium, the molecules of which are oriented, polerized, or said to be magnetized. The strength of the field thus formed will be in direct proportion to the strength of the current which produced it, but inversely as to the square of the distance from the point of generation. Electrical discharges under high pressure can be made audible, visible and palpable (see previous chapter entitled Convictive Discharges, Feb. issue of the American X-Ray Journal). Magnetic discharges can be made audible as in the telephone, visible as mechanical motion and palpable as heat from molecular magnetic friction.

Electricity decomposes liquids and chemical substances in solution, magnetism does not possess this power. Much is known regarding the therapeutic effects of electricity, but although constantly bathed in magnetism, its effects upon the human body are entirely unknown. Magnetism is undoubtedly one of the world's greatest forces, but the function which it performs therein and thereon remains undiscovered. The electrical units are the volt, the ampere, the watt and the coulomb. The magnetic units are the weber, the gauss and the gilbert. As already stated the two forces are co-operative, but their lines of force always extend at right angles to each other. As a definite amount of one is accompanied by a corresponding amount of the other, electrical currents are measured by the amount of magnetism which surrounds them, e. g., the volt-meter, the ammeter, the milliammeter and the watt-meter. *A simple electro-magnet consists of a conductor electrically charged and the polerized or magnetized condition of its environment.* When an electrical current is closed the conductor becomes electrically excited, then the molecules of the surrounding medium orient themselves into rings and lines of magnetic force, this hypothetical, superimposed structure reduces the amount of the electrical flow at its onset, for it is formed at the currents expense, after the magnetic field is formed, the electrical flow rises to its maximum. If we then open the circuit the magnetic field will be immediately discharged onto the conductor and raise the electrical flow above its maximum.

When a static machine is in operation, the prime conductors, rods, combs and all metallic accessories are the seat of an electrical current from which magnetic vortices extend out into space until a finite point is reached, where the force becomes so attenuated that it is neutralized and overcome by the earth's magnetic directive action. In the employment of this apparatus for x-ray work we always consider whether its electrical output is proportionate to the capacity of the Crooke's tube to be used for a given examination. If the generator and tube are mutually adapted, the bulb is placed in simple series and the direct, continuous current utilized. The x-ray light thus produced will be perfectly steady and the strain upon the glass bulb negligible. When the apparatus is too feeble in generating power, the undulatory or interrupted current obtained by interposing one or two additional spark gaps is resorted to, that the magnetic discharge at each break of the circuit may reinforce the electrical flow. Under these unfavorable conditions the x-ray light will be irregular, made up of waves and the strain upon the tube considerable. If a magnetic field is cut by a moving dialectric with a stationary conductor placed on the opposite side, a condition presented by the revolving disks of a static machine, a continuous magnetic discharge or magnetic flux will take place. As the strength of the magnetic field varies inversely as to the square of the distance from its source, it becomes obvious that the intervening spaces between the revolving and the stationary plates should be as slight as possible without actual contact, the glass absolutely true, as thin as is consistent with strength, and their bearings firm, accurate and durable. If the plates are warped or allowed lateral motion a considerable amount of magnetic force may be wasted.

BUFFALO, N. Y.

When it is desirable to intensify a negative or necessary for finer detail, the plate after being washed thoroughly, should be immersed in a solution of mercuric and ammonium chloride, each 20 grains and water one oz. This bleaches the negative white which should be washed again and blackened with 20 drops of ammonia to one oz. of water. These negatives make slower prints but give softer tissues when almost obliterated.

The best screens obtainable are made from platinocyanide of barium. They cannot be used to intensify the x rays, because they fluoresce with a yellow, green light which does not greatly affect ordinary dry plates. The tungstate of calcium fluoresce white and is therefore the best of all fluoresent screens for this purpose. Color-sensitive plates (orthochromatic) may be made to respond to yellow light.

A subscriber writing to us asks for the proper method of using a screen to accelerate the action of the x rays on a sensitive film. He says he has had ten different ways suggested. The proper way is to place the fluorescing surface of the screen against the sensitive film of the plate. It may be used beneath the plate but there will be some distortion. The screen should be smooth. Rough crystals will destroy finer detail.

Prof. W. O. Horner, of Cleveland, Tenn. uses a "developer" made of one oz. eikonogen in 29 oz. of hot water, and adds one and one-half oz. of sulpite of soda (crystals) and one oz. of carbonate of potash. The Professor speaks of this as being the best thing he has used.

ROENTGEN SOCIETY, LONDON.

At the Roentgen Society, London, March 1st, a paper was read by Mr. J. H. Gardiner—"Measurements of the Absorbability of Roentgen Rays." At the April 5th meeting Dr. Norris Wolfenden and Dr. Forbes Ross are scheduled "The Influence of the X-Rays upon the Growth and Development of Mico-Organisms." For May 3d, Dr. Dell-Pratt Harris is scheduled for a short paper—"On a form of Focus Tube Designed to be Self-heating." Members at all the meetings are invited to bring skiagrams and other objects of interest.

Wilson Noble, Esq., is president and F. Harrison Low, M. B., is honorable secretary of the Roentgen Society. The address of the secretary is 12 Sinclair Gardens, W. London.

Mrs. Dr. Tyler Wheeler Wilcox of 526 Main Street, Joplin, Mo., writes that she has had fruitful results with the static currents in cases of recent burns. Two cases are especially referred to in whom extensive burns from fire had caused very large blisters followed with extreme pain and depression. Within a few hours after the accident the burned surfaces were subjected to the metalic electrode gently rolled over the affected parts. Two minutes was sufficient to stop the pain, and swelling which had already begun, rapidly disappeared. There was no relapse.

Exhibition of Skiagraphs: Report of Cases.*

By J. T. Dunn, M. D., Louisville, Ky.

At the present time it is not necessary to relate to you that the x-rays are capable of doing serviceable work fo the surgeon. It would be only a waste of time for us to discuss the scientific aspect of this wonderful agent. It is a science that is established beyond any doubt, and it only remains for us to avail ourselves of its use. In the light of this discovery damage and malpractic suits should become a thing of the past to the physician who makes and records photographs of his cases of fractures, dislocations, etc. They are evidence which cannot be denied. It is quite common for me to be consulted by some party who thinks he has a case against some surgeon for mal-practice and wants to prove it by the x-ray. I invariably reject such requests. The attending surgeon himself should have a photograph in his possession showing the bones, joints etc., in proper relation. Then he is master of the situation. The beneficial effect of the x-rays then cannot be doubted. I exhibit for your inspection, in proof of the foregoing statements, a few photographs.

Fig. 1 is a skiagraph showing a bullet of 32 caliber in the chest. This ball entered in the fourth interspace on the right side of the sternum, passing upward and backward. Immediately after the injury it was probed for, but was not found. That it passed through the lung there is no doubt, as blood was expectorated freely. Patient was sent to the x ray laboratory, and the ball was located in the trapezious muscle about an inch from the surface. It was removed through a very small incision. The man recovered.

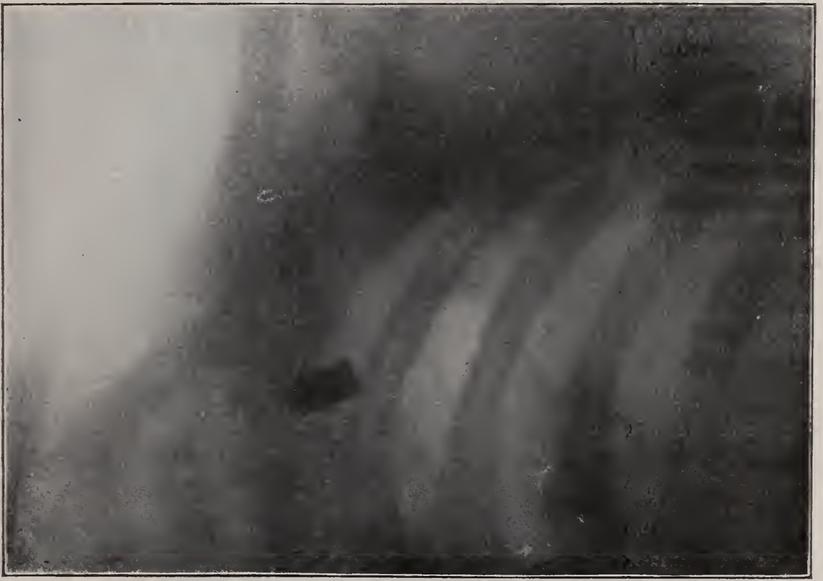

Fig. 1. 32-Caliber Bullet in the Chest.

Fig. 2 shows a 22-caliber ball in the foot. This skiagraph was made with the shoe and sock on, which only adds to the wonder of the x-ray work. The bullet was easily removed after being located.

The accompanying shadowgraph (Fig. 38) shows a foreign body located in the esophagus just behind the larynx. The shadowgraph is of a six-year old girl, from Central Indiana, who was sent to me through the kindness of Dr. Woody to locate a brass rivet which the child had accidentally swallowed seven months previously.

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*Read before the Kentucky State Medical Society, 1899.

She came to me very much emaciated, having been unable to swallow any thing except a small quantity of liquids for seven months. She presented a livid appearance about the face and neck. With mouth open, nostrils dilated, head thrown back, and gasping for breath, she presented a pitiful picture.

The history given to me by her father is as follows: " Seven months ago, while she was playing with an old brass rivet which I removed from a threshing machine belt, she swallowed it. It has the cap battered on the butt, so that it looks very much like a spool. She had some difficulty in swallowing it, making desperate efforts occasionally, and at other times coughing. The family physician was summoned, and, upon examining, failed to locate the foreign body, but said, however, in his opinion the rivet had passed into the stomach and would cause no harm.

" From that time to the present she has had difficulty in swallowing, gradually growing worse. Three months ago she began to experience slight difficulty in breathing, especially at night or in the daytime when she would lie down for a nap. This difficulty also grew worse until it was dangerous to allow her to go to sleep, for unconscious as she was during her sleeping moments, she was unable to make the necessary effort to keep up respiration.

" At present, and in the last week, her mother or myself have watched her every night, and when she stopped breathing we would arouse her and with her voluntary efforts she was enabled to carry on respiration Deprived of her rest and nourishment, she has grown quite thin."

With this history and forlorn hope, promising the father to do my best, I set about to relieve the little sufferer, and, if possible, to restore her to health. I placed the patient under the x-rays, and with my fluoroscope I searched the stomach and intestines. At a glance I could see, however, that it was not there. Passing from the abdominal region up over the thorax with my fluoroscope, I could see nothing but heart, liver, ribs, and backbone until I reached the cervical region; there I saw located behind the larynx the rivet lying in the position shown in the shadowgraph. Placing my hand upon the neck immediately over the rivet, and making alternate pressure from side to side, I could see the rivet gliding under my finger between the larynx and the cervical vertebræ.

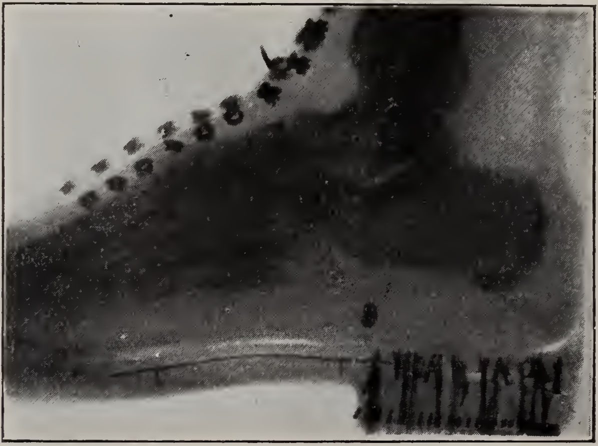

FIG. 2. 22-CALIBER BALL IN THE FOOT. (SHOE ON.)

It was now plain what should be done. The diagnosis had been instantly made, and correctly made beyond the shadow of a doubt. The most unfortunate circumstance was that it had not been made earlier. She was immediately sent to St. Joseph's Infirmary and prepared for the operation. To remove this foreign body with its cutting edges, which were already imbedded in the tissues, by way of the pharynx, with long-bladed forceps was entirely out of the question. It would have done irreparable damage to the esophagus and larynx had I attempted it, and esophagotomy offered the only method of removal.

In a couple of hours all was ready. She was then brought into the operating room, carefully anesthetized by Dr. H. E. Tuley. This part of the procedure gave me considerable concern, because I knew that respiration in her case had to be carried on by voluntary action, and to render her unconscious meant, of course, to deprive her of this assistance. She took very little chloroform, and passed under it with no excitement. The operation was hurried. Owing to the above reason the anesthetic had to be withdrawn. I proceeded by making an incision an inch and a half long over the anterior border of the sterno-cleido-mastoid on the left side, the center of which was opposite the foreign body. Dissecting my way carefully, but hurriedly, holding the carotid artery and the jugular vein to the outer side of my incision, I reached the outer surface of the esophagus. With the foreign body as my guide, I made an opening into the esophagus as far posteriorly as possible, in order to avoid the recurrent pharyngeal nerve, bringing into view the rivet, which was grasped by forceps and removed.

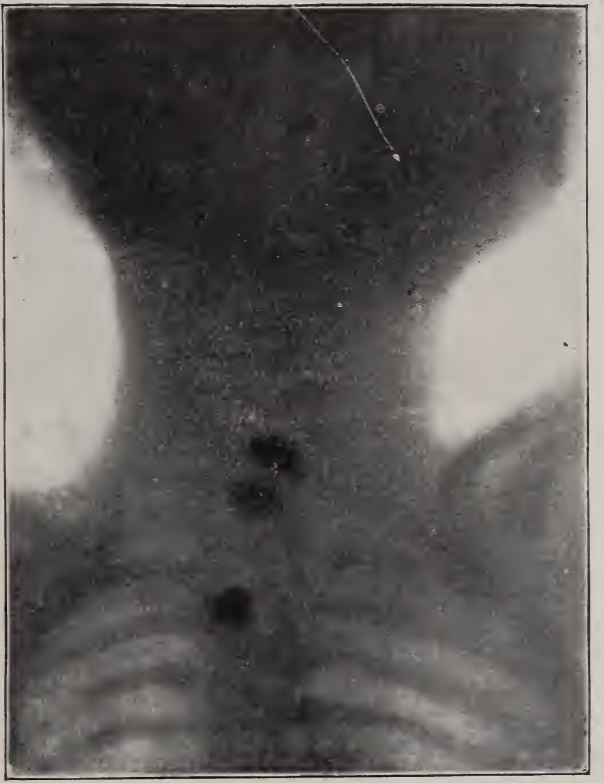

FIG. 3. BRASS RIVET IN THE ESOPHAGUS.

As I said before, unfortunately this matter had been put off too long, and the child died on the ninth day, having made no effort at repair, the entire wound being poisoned by the corroded brass.

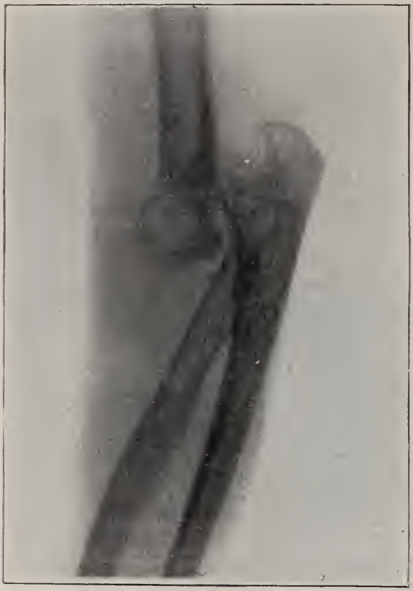

FIG. 4. BACKWARD DISLOCATION OF THE ULNA AND RADIUS AT THE ELBOW.

This case serves to show the diagnostic value of the rays in dislocations. The accompanying shadowgraph was made from a gentleman who fell from a two-story building in the country, alighting upon his right arm and side, twisting the arm under him. A visiting physician who was present at the time had the young man carried into the house where he examined him, and, according to the history I received from the patient himself, the doctor pronounced it a "backward dislocation and an outward fracture." He also said that the doctor put it back in place, dressed it, and sent him to a neighboring physician for future attention. That was one year before the patient consulted me.

The arm is in complete extension; flexion, supination, and pronation are entirely lost.

I turned the x-rays on, with my fluoroscope could readily see the trouble—a backward dislocation of both bones. He refused to have anything done for it, and it is still in that position. The arm very materially cripples this man in his business, and if the doctors who had charge of him had been in possession of an x-ray instrument at that time, there would not have been any doubt in their minds as to whether this dislocation had been reduced or not.

What defense could a surgeon make now who would have such a result?

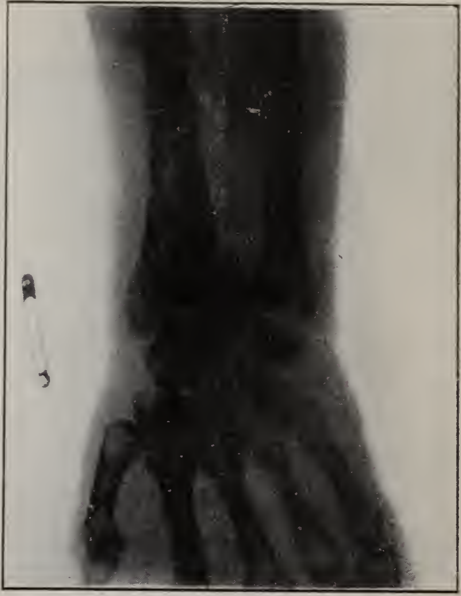

FIG. 5. COLLES' FRACTURE (COMMINUTED.)

The accompanying skiagram (Fig. 5) show a comminuted Colles' fracture dressed in cotton and splints, covered over with bandages. This skiagraph was taken about two weeks after the accident, and while the lines of fracture are not as distinct as if taken earier, they are easily seen to run in all directions, some extending up the radius longitudinally as high as three inches above the joint. It also shows considerable callus in the interosseous space near the joint, which will probably give considerable obstruction to supination and pronation if not absorbed.

This view of the wrist and radius indicates to the surgeon that the bones are in excellent position, and so they are as far as lateral position is concerned; but take a look at Fig 6, which is a side view of the same hand, and you see a considerable dipping in the dorsal outline of the radius, giving to the wrist, as indicated by the dorsal surface of the wrist, what might be called a "swayback deformity." If the radius had been arched by a heavy pad upon the anterior splint under the lower end of the upper fragment, and a small pad under the dorsal splint placed upon the upper end of the lower fragment, union would not have taken place in this deformed position. The natural arch in the radius at this point should be kept in mind by the surgeon who attempts to replace the fragments of a fractured radius in this location, and ample padding be used to maintain this natural curve. This faulty position is very likely the cause of this large callus in the interosseous space.

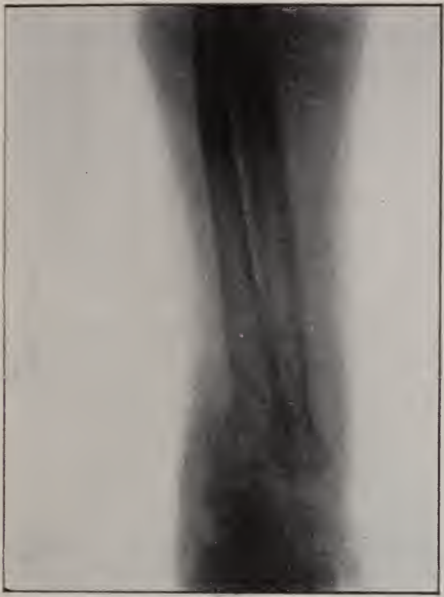

FIG. 6. SIDE VIEW OF COLLES' FRACTURE.

Here again is the practical inability of an excellent surgeon to know the condition of this patient's radius until revealed to him by the x-rays. When the x-rays are consulted in every doubtful case of injury about the wrist and other joints, there will be fewer bad result from such injuries.

Fig. 7 represents the arm of a boy five years old, who slipped and fell with his arm under him in the bath-tub. He cried that his arm was hurting him, and his mother immediately took him to Dr. Banta, the family physician, who has access to the x-rays. After a thorough examination without the use of the rays, he was unable to make a diagnosis, so a skiagraph was made which distinctly showed an epiphyseal separation at the lower end of the humerus. The diagnosis being thus positively made, an anesthetic was given, the fragments placed in opposition, and a dressing with a hard rubber, right-angle, gutter splint applied.

Three days latter the father came to us with the boy, saying that he had fallen down steps, and he was afraid the bones were out of place again.

To determine the condition of affairs another skiagraph was made, with the splint, cotton, and bandage in position. Sure enough, the epiphyseal fragment had been forced backward as shown in the accompanying skiagraph. Under an anesthetic it was again replaced, and a peep through the fluoroscope was sufficient to show that the fragment was in the proper

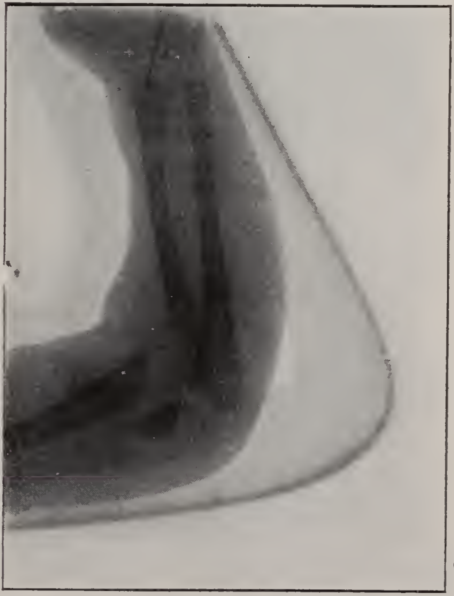

FIG. 7. EPIPHYSEAL SEPARATION AT LOWER END OF HUMERUS.

place. The arm made an uninterrupted recovery.

Fig. 8 shows an ununited fracture of the tibia. This patient came from Tennessee with the following history: A horse had fallen upon his leg, breaking it below the knee; his family physician dressed it for him in plaster-of-Paris, and in three weeks removed the dressing. He was very much surprised to find that no union had taken place. It was now seven months since the accident, and yet there was absolutely no union. The x-rays were turned on his leg, and a peep through the fluoroscope showed the secret of the whole matter. The fracture was oblique, and the lower fragment had passed around the upper and had not been replaced. Of course union was impossible in this position.

The skiagraph also shows a united fracture four inches below the ununited fracture.

The treatment consisted in converting this simple fracture into a compound, biting off the overlapping ends, drilling and wiring them together.

The question of x-ray burns is a serious one. It is one that is usually closely inquired into by the patient and his friends, as it is well known that the rays do produce a burn of the skin, and even extending into the deeper structures if not properly applied, and even then, with all the care possible to exert, a case is occasionally encountered in which there seems to be an idiosyncrasy—just as you find people who can not take quinine or morphine.

The patient should understand fully this danger, in the presence of witnesses, before the work is attempted. I have been very fortunate in not producing a single burn. In my private laboratory, and in the x-ray laboratory at the Kentucky School of Medicine, where I have been connected until recently, I have made approximately three hundred exposures, and although I have made some few exposures, thirty minutes long, I have caused no evidence of dermatitis or "burn." In one case I remember making at least ten exposures (hip joint) before succeeding, and they were quite lengthy, yet no trouble ensued. Danger of burning is increased by two things: first, by proximity of the tube to patient; second, by length of exposure. Nikola Tesla, the expert electri-

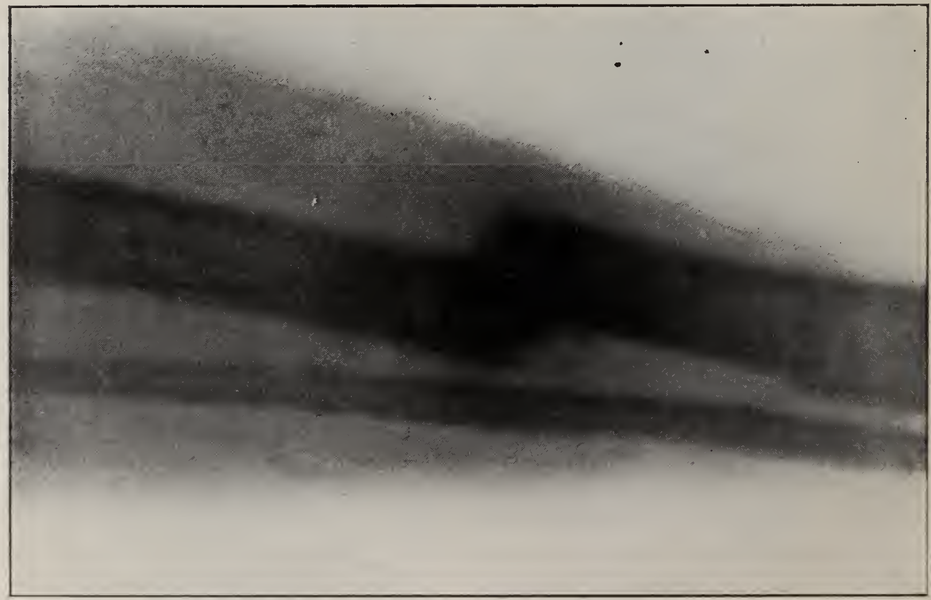

Fig. 8. Ununited Fracture of tibia.

cian, after investigating the cause and extent of these burns, says, in the *Electrical Review:* "According to the evidence I am obtaining, the tube when in action is emitting a stream of small particles; there are some experiments which seem to indicate that these particles start from the outer wall of the bulb; there are others which prove that there is an actual penetration of the walls, and in case of a thin aluminum window I have now not the least doubt that some of the finely disintegrated cathode matter is actually forced through. I come to the very comforting conclusion that no matter what the rays are ultimately recognized to be, practically all their destructive energy must spend itself on the surface of the body, the internal tissues being in all probability safe, unless the bulb should be placed in very close proximity to the skin, or unless rays of far greater intensity than now producable are generated."

There can be no doubt that deep burns have been produced, but from all reports which I have seen, the cause could be traced to the proximity of the tube to patient, or lengthy exposure. The temptation to place the tube close to the body and make a hurried exposure should be guarded against, for quick results, I believe, mean increased danger of burns. Rapidity should not be our chief aim; we must never, under any circumstances, sacrifice safety to make a record for time. The old adage, "haste makes waste," holds good here.--*The Louisville Monthly Journal of Medicine and Surgery.*

* Half tones by International Journal of Surgery.

Elizabeth Fleischman, who has done so much x-ray work on the Pacific slope, has recently extended her influence into the favorable graces of the United States government. While Surgeon General Sternberg was in San Francisco he visited the x-ray laboratory of Miss Fleischman's and complimented the operator for the excellence of the many pictures she had made. Miss Fleischman has done some radiographic work for the United States Medical Department, some of which will be reproduced in the Medical History of the War.

Five Weeks and a Six-Mile Walk with Broken Neck.

YONKERS, N. Y., Dec. 8. — A man dragged himself into St. Joseph's Hospital here this afternoon and asked to be admitted. He said he had fallen from a scaffold and had broken his neck. The fall, he said, occurred five weeks ago. Dr. O'Neil, the house surgeon, doubted that the man's neck was broken, but later found the statement was strictly true and x-rays showed the bone pressing against the spinal cord. His left side was paralyzed. The leg on that side was totally useless. The paralysed side was sensitive to feeling, almost abnormally so, while the side which still retained power of locomotion was without feeling. The way Moriarty walked was to place the cane he carried in advance of his body and then hop forward upon his right foot, the one devoid of feeling.

Moriarty says that after he fell he was taken to his boarding-house, where a physician put his neck and head into a plaster cast. He was unconscious for two weeks, and then he appeared to recover. He suffered no pain, and dismissed the doctor. Recently the pain was intense in his left side until it became paralysed. He says he now suffers pain in the back of his head. — *Ex.*

Roentgen and Becquerel Rays.

WALTER.

An account of experiments showing that there are considerable differences in the absorption and diffusion of these two types of rays. The strong diffusion of Becquerel rays by air and by bodies of small atomic weight, renders them unfit for surgical use.—*Fortschritte d. Rontgenstrahlen*, III; abstracted in Lond. *Elec.*, Feb. 2.

EPITHELIOMA.

512 11th Street, Oakland, Cal.
January, 1900.

DEAR DOCTOR ROBARTS:– The Epithelioma referred to in recent letters was my own case. Briefly: It commenced in 1860 as if something was crawling near the ala of my nose, right side. Then a scale formed with the same sensation. After a time it would bleed when picked off. This scale continued to grow larger and deeper until it became as large as half a silver dollar, when sixteen years ago I had it cut out. After about five years it returned on the left side of my nose and increased more rapidly than before. I had it cut out the second time eleven years ago. It returned and about seven years ago I had it cut out again. It soon returned, but I have had no surgical work done on it since. It had eaten away about half of my nose, about half of my upper lip and a portion of my left cheek and was nearly up to my left eye, having destroyed a portion of the orbicular muscle.

Having heard something of the action of of the x-rays in Lupus I determined to try the experiment on myself. I therefore went to a friend of mine, Dr. Chamberlain of this city, who has an x-ray machine, and explained the matter to him when he consented to try it in my case. After procuring some lead rolled thin for a mask, we cut out enough to allow the Rays to strike the sore and about one fourth of an inch of skin outside the sore. The right side of my nose had to be exposed on account of the disease having invaded the inside of it and had eaten away the cartilagenous portion of the vomer and the mucus surface of the nostril. I directed that the rays should be applied at a distance of four inches for five minutes duration. This was repeated every day for eight days, then ten minutes for four or five days when an exudation made its appearance on the under lip which was nadvertantly exposed. It also appeared on the outside of the nose. The rays were then taken only every other day for ten minutes duration until the fungus bleeding surface had assumed a healthy appearance. The swelling had also disappeared. Then the rays were used for five minutes for a time, and then three minutes. It was then omitted for two weeks because the cicatricial tissue seemed to be sound. It was found to be quite thin and easily broken down in places. The rays were resumed for five minutes every other day.

I commenced the sittings the 12th of October, '99, and I now consider myself practically well, I will probably have the ray applied now and again until the tissues become firmer.

Hoping this will interest you, I am

Very sincerely,

J. M. SELFRIDGE, M. D.

X=RAY WINS $15,000,

Mr. Benjamin F. Cochran of Philadelphia, obtained a verdict of $15,000 on the 14th inst., through the instrumentality of the x-rays.

Dr. M. K. Kassabian the expert from the Medico Chirurgical College and hospital was called to the stand and gave the court an interesting and lucid explanation of the x-ray's, and the part they played in the diagnosis of B. F. Cochran's injuries.

Cochran was represented by Robert B. Kelley, and the railway company by William J. Smyth. Seven medical experts testified that Cochran was rapidly going blind as a result of his injuries, which included a fracture of the skull and also a facture of the spine.

On August 3d last the plaintiff was a passenger in one of the defendant company's cars on Penrose Ferry road, which ran into an open switch at the crossing of the Baltimore and Ohio Railroad tracks. The sudden stopping of the car threw Cochran against another passenger, breaking the latter's leg. The plaintiff's head struck the front woodwork of the car and a permanent injury to his skull was inflicted which, it was testified, might result in an incurable mental disorder.

The plaintiff alleged that the accident was due to carelessness on the part of the motorman who, he contended, was racing with a bicyclist who was going at an unusually high rate of speed.

On the part of the defence it was sought to show that the accident was unavoidable by reason of an electric light at the switch being out.

The case lasted two days. The experts who testified were Dr. William Porter, Dr. Joseph Hearn, Dr. Robert Jones, oculist; Dr. George F. Stevens, Dr. William Saunders, Dr. Mihran Kassabian, the x-ray expert at the Medico-Chirurgical Hospital, and Dr. John Weston.

IMPROVISED A STATIC X-RAY MACHINE.

FRUITA, COL., Feb. 10, 1900.

DR. HEBER ROBARTS, EDITOR AMERICAN X-RAY JOURNAL.

Dear Sir:—Last summer I purchased a 4 plate Toepler machine for therapeutic and x-ray use which worked very satisfactory considering the size of plates, which were 25 and 28 inches. I have recently constructed a machine of my own design having 4 27-inch revolving plates and 4 30-inch stationary. I am pleased to say that it works much better than I expected. The therapeutic effect is excellent. The polarity does not seem to change often. By a little manipulation the polarity can be changed, the machine reversed to suit the operator, providing he has any choice of position. Am doing x-ray work with this machine as a diagnostic assistant to my medical and surgical work.

Yours truly,

J. M. G. BEARD.

Dr. J. M. Haney of Centralia, Ills., has recently installed in his office a ten plate electro-therapeutic and x-ray machine. The doctor is one of the youngest and certainly the most advanced practitioner in Centralia. He has taken up the most advanced methods for diagnosis and treatment, working in the field with fifteen or twenty older competitors, who "trod along in the same old way." The intelligent people of Centralia have given evidence of their appreciation of Dr. Haney, as is witnessed by his very large paying practice.

International Congress of Medical Electrology and Radiology.

At the request of the French Society of Electrotherapy and Radiology, the International Congress of Medical Electrology and Radiology, the initiative of which it has taken, is connected to the International Congress of 1900.

A Commission, which is composed of: Messrs. *Weiss*, Professor of the University of Paris, President; *Apostoli* and *Oudin*, Vice-Presidents; *Doumer*, Professor at the University of Lille, General Secretary; *Moutier*, Secretary; *Boisseau du Rocher*, Treasurer, and of Messrs. *Bergonie*, Professor at the University of Bordeaux; *Bouchacourt*, *Branly*, Professor at the Catholic Institute of Paris; *Larat*, *Radiguet*, *Villemin*, Surgeon of the Hospitals of Paris; has been asked to assure its organization.

This Congress will take place in Paris, from the 27th of July to the 1st of August, 1900.

All inquiries for further information must be forwarded to Prof. E. *Doumer*, General Secretary, 57 Rne Nicolas-Leblanc, Lille.

Adhesions are to be sent to Dr. *Moutier*, 11 Rue de Miromesnil, Paris.

PROF. E. DOUMER,
The General Secretary.

Printing by Roentgen Rays.—Le Roux. Electrical World & Engineer.—An article on the Izambard method, which has already been noticed in the Digest. In order to obtain black letters on light ground, the original writing or print is made with a non-metallic ink which has the property to resist fatty ink and the whole paper is then covered with a fatty metallic ink which adheres to all parts except on the letters. The application of this method for secret letters and for artistic designs is discussed and some notes are given as to priority of the invention. All the details of the method are said to have been improved recently and that the method will be exhibited at the Exposition in Paris.—*L'Elec.*, Dec. 16.

Another "X-Ray" Trick.

A correspondent of the *Scientific American* describes a device of his own, which apparently reproduces instantaneously and neatly the interior of the human body giving to every organ its natural color. The whole operation is performed under the eyes of the bewildered sitter, who watches the x-rays in what seems to be the act of drawing and painting before his eyes his vital organs.

The apparatus looks like the objective tube of a camera, with the plate on which the image is to be produced in full sight of every one. The apparatus is placed opposite the person whose viscera are to be photographed and to heighten the effect a lamp may be solemnly placed behind the sitter. The operator invites every one to look at the white sheet of paper and presses the rubber bulb of the shutter. A colored image appears instantaneously on the paper. The lungs are of a bright red color, the heart is darker, the veins are blue, the stomach and intestines are of a greenish tint; other parts of the body paint themselves in black on the white paper. This sudden apparition generally startles the sitter; but a few remarks on the healthy looks of his lungs will place him at his ease. The photograph is taken out of the apparatus and passed among the spectators.

The secret of the trick is this:

The sheet of paper is previously prepared by tracing on it the outline of an anatomical drawing, and then painting the several parts with different salts which, in reaction with perchloride of iron, will severally develop the appropriate coloring of each of the principal internal organs. As the solutions are colorless the drawing is invisible when the paper is dry.

The objective tube contains merely a small atomizer filled with a solution of ferric chloride. When pressed, the rubber bulb sends air not, as every spectator belives into a pneumatic shutter, but into the atomizer. As a result a fine and invisible spray of the perchloride of iron solution reaches for a moment the sheet of paper. What follows is easily understood by every student of analytical chemistry.

The reactions between ferric salts on one side, sulfo-cyanide of potassium, ferro-cyanide of potassium and tannin on the other side, are among the most sensitive of analytical test, owing to the extraordinary intensity of the red, blue and black colors which originate in these reactions. Hence the instantaneous production of the colored picture.—*Sanitary Era.*

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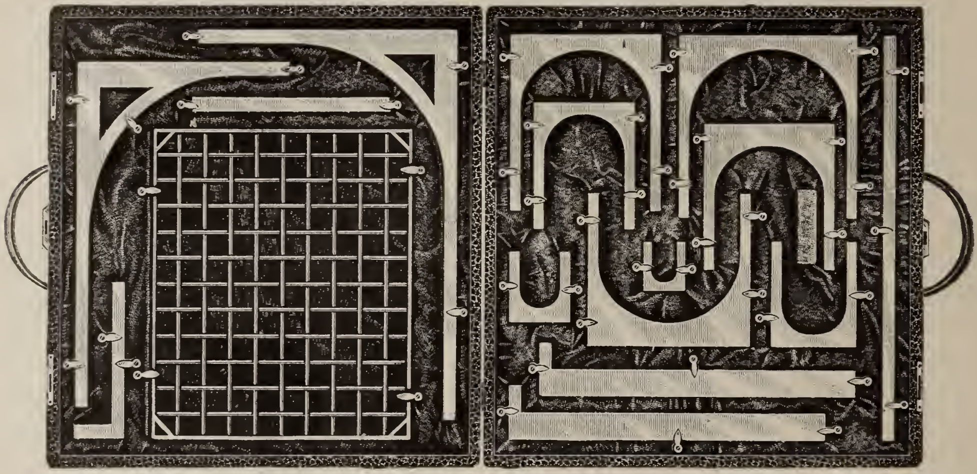

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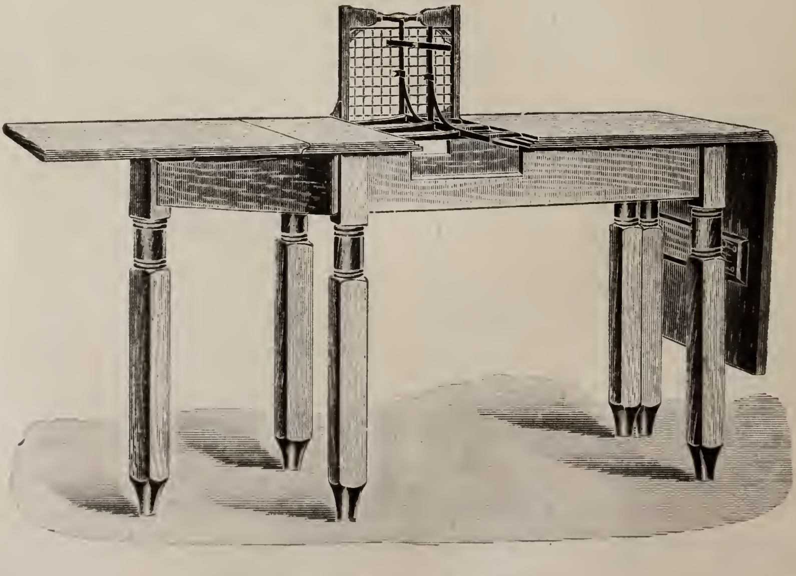

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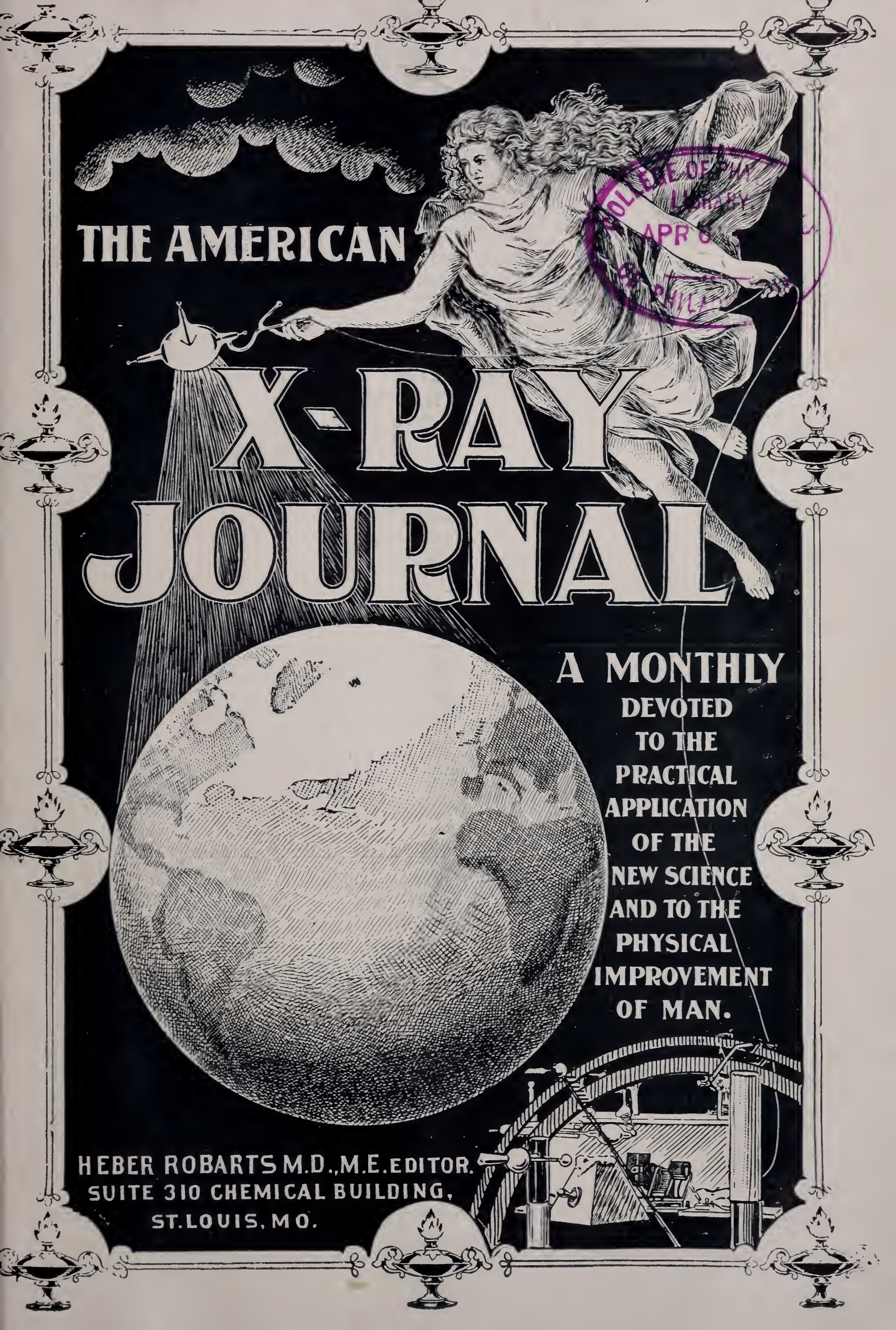

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